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Joseph E. Johnson, President, American Association of Orthodontists, 1950—1951

American Journal
of
ORTHODONTICS

VOL. 36 NOVEMBER, 1950 No. 11

Original Articles

PRESIDENT'S ADDRESS, AMERICAN ASSOCIATION OF ORTHODONTISTS

MAX E. ERNST, D.D.S., ST. PAUL, MINN.

Members of the American Association of Orthodontists and Guests:

According to the bylaws of the American Association of Orthodontists the president shall deliver a president's address before the Association. It is therefore my duty and it becomes my pleasant privilege to address the members of this Association upon the occasion of the forty-sixth annual session. This duty and privilege accompany the honor which you, the members of the Association, bestowed upon me when you elected me your administrative officer for this year. It is indeed a great honor; I am deeply appreciative of it and am very grateful to the members who are responsible for it.

This Association was brought into being in June, 1901, almost fifty years ago, when Dr. Edward H. Angle, together with that small group of men to whom he had given his first course of instruction, formed the first society of orthodontists which was called the Angle Society of Orthodontists. The name was later changed to the American Society of Orthodontists, and since 1939 it has been known as the American Association of Orthodontists.

I think it is only proper that we give credit and honor to the man to whom this Association owes its inception, who had the vision and foresight to consider orthodontics a distinct specialty of dentistry and who envisioned a successful association of those persons who limited their professional activities to the practice of this specialty.

During these years this specialty and this Association have developed under the guiding hands of many earnest and conscientious members who gave much time and thought to the furtherance of its success and welfare. Concerted action on the part of officers and members through these years has brought the Association to the high standing which it now enjoys. From the small group which met together on that June morning in 1901, this Association has grown a hundredfold, until at the present time its members number approximately one thousand, located in the United States, Canada, and Cuba, members who are definitely interested in carrying out the objects for which it was formed.

It is extremely interesting to turn back the pages of orthodontic history in order to refresh our memories regarding what was accepted as proper thought and procedure in the earlier days of the Association. Statements made by prominent, careful, and skillful orthodontists, a few short years ago, will illustrate the changes in many phases of our practice in a comparatively short time. It will tend to prove again that what is accepted as proper teaching and treatment procedure today may be practically obsolete tomorrow. It will show that we have been too positive in our statements regarding many phases of our specialty. Through the years we have been inclined to quote and accept opinions as facts, opinions which, in many cases, were not supported by scientific or clinical evidence. Through the years we have undoubtedly assumed too much and we have jumped to conclusions too often.

One of the important objects of this Association is to educate and enlighten the members along broad lines for the advancement of orthodontic information and practice. This is accomplished by presentation of scientific papers and clinics at the annual sessions and by study and research which give us practical knowledge for our use and information.

Much original research has been carried on during the last few years, and a great deal of valuable information has been gained thereby. New diagnostic aids have been uncovered which have caused us to discard some of our accepted theories and which have made our treatment and practice more definite and more efficient.

This Association has, for some years, contributed a sum of money as a prize for the best essay upon an original research problem. This prize has been awarded annually. There has also been set up in the budget annually an amount of money available for grants-in-aid for persons who are carrying on research projects. A half day has been set aside in the program this year for the report and presentation of research studies. More than thirty of such reports are to be presented, mostly from students of graduate orthodontic courses. Graduate orthodontic courses have resulted in the carrying on of a good deal of research by the graduate students. The establishment of a Research Section, as a part of our meeting, offers a meeting ground for discussion by persons interested in these research problems. It offers an opportunity, also, for our members to become somewhat familiar with the research activities. The number of reports are increasing from year to year, and the time will probably be at hand soon when a full day will be allocated to this section. The members of the Research Committee are entitled to the thanks of the Association for this interesting section of our meeting.

The AMERICAN JOURNAL OF ORTHODONTICS is now in its thirty-sixth volume, and a history of this Association is contained within the covers of these volumes. There is no greater fund of orthodontic literature and information to be found than in the pages of the JOURNAL, and we have good reason to be proud of its high standing throughout the years. Credit is due to The C. V. Mosby Company, publishers, for the interest shown in procuring and publishing this scientific material, and also for the cooperation with this Association in the publishing of the transactions of the annual sessions. A great deal

of the time the publishing of the JOURNAL was not a financially profitable endeavor, but the keen interest evidenced in our specialty by the late Dr. Mosby prompted him to keep up the publication.

Due to the efforts of our editor-in-chief, the vigilance and economy procedures instituted by the associate editors and the members of the Editorial and Publication Board, and the excellent cooperation of the publishers, the JOURNAL managed to show a small profit last year. While the amount of the profit was small, the difference between this amount and the deficit suffered the previous year was a fairly good-sized one. Definite economy measures have made this possible without affecting the standing of the JOURNAL. A yearly profit of this small amount, however, will hardly warrant the continuance of the JOURNAL along present plans. A larger number of subscribers, or a greater volume of advertising, or both, will probably be necessary to continue as at present. If these two sources of revenue have approached their maximum capacity, an increase of subscription price may be the only alternative.

One of the reasons for the increased cost was the large number and greater cost of illustrations which accompanied so many of the published articles. In the report of the Editorial and Publication Board last year the suggestion was made that each constituent society place a per capita assessment upon its members to help defray this increased cost in the publishing of papers presented before their respective societies. I objected to this suggestion on the ground that scientific articles were published in the JOURNAL for the benefit of the entire membership and that it was hardly fair to assess the members of a constituent society in order that we may have the benefit of the presentation of scientific material before such society. Deficits in the JOURNAL, caused by increased cost of illustrations, or other necessary procedure, should be assumed by the Association. Especially is this true while we have a sizable balance in the treasury. We may well be proud of the JOURNAL and the service that it has rendered through the years. We are grateful to Dr. Pollock, the editor-in-chief, for his untiring efforts, and we deeply appreciate the interest and unselfish service of the associate editors and the members of the Editorial and Publication Board.

The American Board of Orthodontics is now in the twenty-first year of its existence. As of last year the Board has granted certificates to three hundred persons. This is about 30 per cent of the membership of the Association and is definite evidence of the regard and esteem in which the Board is held. Very definite requirements have been set up by the Board for applicants, and the person who becomes a diplomate has every reason to be proud of the fact that his professional knowledge, judgment, and skill have been evaluated and that they have met the high standards which have been instituted by the Board for those whom it certifies. According to the Board the material which is submitted by the applicants, such as theses and case reports, is improving from year to year. Two of the papers to be presented on our program are theses which were presented to the Board and which, it was felt, were of such high standard that they would merit a place on the program.

Of the five dental specialty certifying boards (you might say there is a sixth one, arranged for the Board of Oral Pathologists in San Francisco last year), the American Board of Orthodontics is the only one whose requirements for certification have not been approved by the Council on Dental Education of the American Dental Association. This Council has proposed certain requirements for all dental specialty boards which call for more graduate or postgraduate instruction than is at present required by the American Board of Orthodontics. Since, however, the Board requires membership in the American Association of Orthodontists for those who apply for certification and since the proposed bylaw amendments, which outline minimum educational and preparatory requirements for membership in the Association, will probably be adopted at this session, it would seem that the Council on Dental Education and the Board will soon be able to agree upon preliminary requirements which will satisfy both groups. I feel that every effort should be made by the representatives of these two Associations to meet on some common ground.

Membership on the Board involves arduous tasks and takes much time. I want to express to the members of the Board the thanks and appreciation of this Association for the unselfish service which they have rendered.

In looking over your program you will notice that there will be no presentation of the Albert H. Ketcham Award. The committee, whose duty it is to select the recipient for this honor, after careful consideration, was of the opinion that no presentation be made this year.

The methods involved in making the selection for this Award, I feel, are not entirely satisfactory. In case of several nominations, making a selection by correspondence by five committee members may not be the best way to reach a decision. It is my opinion that the matter could be dealt with more efficiently by having the committee meet at the time of the annual session. Prospective candidates could be discussed at that time and a selection agreed upon. The presentation of the Award could then be made at the next annual session. I am offering this suggestion to the incoming administration.

During his incumbency Dr. Lowrie J. Porter appointed a special committee to study the question of qualifications for membership in the Association and in the constituent societies. Definite recommendations were made by the committee. They were introduced as amendments to the bylaws and are to be voted on at this session. This committee gave a good deal of thought to this problem and I feel that, with minor changes, these proposed amendments should be adopted. There are a few changes which I feel should be made.

The proposed new Section 8, Chapter XIV reads: "The minimum standards of eligibility for associate membership in the constituent societies shall be:

"1. One year of post graduate training, recommendation by the head of the orthodontic department, or

"2. One calendar year of preceptorship with an active member, recommended by preceptor."

In both of these cases, one person, the head of the orthodontic department or the preceptor, has full authority to prevent a person from becoming an associate member. This, you will agree, is not as it should be. Opinions regarding an applicant's qualifications should, of course, be obtained from the preceptor or the head of the orthodontic department, but the acceptance of such applicant to membership should not be wholly dependent upon such opinion or recommendation.

In the same section, Subsection 3 and 4, a similar condition would exist. In these two cases the sources of orthodontic training must satisfy the entire committee which passes upon applications. This again makes it possible for one person to prohibit an applicant being elected to associate membership. I think you will agree that this is hardly democratic procedure.

The same reasoning would, of course, apply to the proposed amendment of Chapter I, Section 2, Subsection A, where the training and qualification of the applicant must satisfy the entire committee. It is my opinion that the word "entire" should be stricken in these instances.

I realize that the membership committee, which presented these proposed changes, intended to place the necessary requirements for membership upon a plane where the applicant must be reasonably well qualified. I am quite certain, however, that they are not in favor of granting so much authority to any one individual under these various sections. I think that you will agree that these changes should be made in the proposed amendments, and I am quite certain that, with these changes adopted, you will vote favorably upon the amendments.

I have a similar criticism of the procedure of the nominating committee. This committee is composed of the directors of the various constituent societies, a member at large, and the president who is chairman of the committee. The president may vote only in case of a tie. If you will analyze this provision you will see that under certain circumstances the president would decide who, of two candidates, should be nominated. The president, in that capacity, is acting under some disadvantage and possible embarrassment. I would suggest that the president be chairman of the committee without the right to vote. There is no provision which states that this committee shall bring in only one nomination for an office and, in the case of a tie, it is my opinion that both candidates should be nominated.

At the time of reorganization of this Association into constituent societies, all except one of these societies were already in existence as independent societies and there were no geographical limitations regarding membership in the societies. There are, therefore, numerous instances where persons practicing within bounds of one constituent society are active members of a different constituent society. There is some ambiguity in the constitution and bylaws regarding this matter.

The constitution states, "The plan of organization of the American Association of Orthodontists stipulates that an active member must be an active member of the constituent society representing the area in which he practices."

Chapter I, Section 4 of the bylaws states, "A member who moves to another district must, in order to retain membership in the Association, become a member of the constituent society in the district to which he has removed."

According to Chapter XIV, Section 8, "An orthodontist engaged in practice near the boundary line of a constituent society, outside of its jurisdiction, may be elected to membership by such constituent, provided previous consent is obtained from the constituent within whose jurisdiction he is eligible to apply for membership, or an active member may be transferred from the constituent to another under the same conditions."

While it may be a question whether the present membership of a constituent society should be disturbed, it is my opinion that, in the future, a person shall be an active member only, of the constituent society within whose boundaries he practices. I recommend that the bylaws be amended to bring this about. There is, of course, no objection to a constituent society having members, other than active, outside its own boundaries.

Chapter III, Section 2 of the bylaws provides that in the event of a vacancy in the office of president, the president-elect shall assume this office. It is my opinion that the vice-president should succeed to the office of president under the foregoing conditions. One of the important reasons for electing a vice-president is that he assumes the duties of the president in his absence. It seems to me that this should also be true in case of vacancy in the office of president.

According to the bylaws the president shall be installed at the annual session subsequent to the one at which he is elected. After his election and until he is installed he shall be known as the president-elect. There is, apparently, no provision for the election of a president in the event that the office of president-elect becomes vacant. I suggest that provision be made that, in such event, a president may be elected to take office as president at the close of the annual session at which he is elected.

I am interested in the report of the Committee on Education which is being presented at this meeting. The discussion of orthodontic teaching took most of the time at the meeting of the American Association of Dental Schools this year. Interesting presentations were given by members of orthodontic departments, and these discussions, among other things, emphasized the fact that the teaching of fundamental orthodontic subjects had a direct bearing on, and relation to, much of the clinical dentistry. For some time the Education Committee of this Association has urged changes and improvements in orthodontic education, and I feel that the discussions at the meeting of the American Association of Dental Schools this year, the participants in which were members of this Association, are a definite indication of what may be accomplished in the future in this regard.

I am interested also in the large number of members of this Association who are actively interested in dental association activities, both on a local and on a national level. Quite a number of our members are officers of their state dental associations. Our member, Dr. Philip E. Adams, is president of the

American Dental Association. Other members are well represented in the House of Delegates and as members of important councils. To me this is a favorable sign and an indication that most of our members are of the opinion that they are definitely a part of dentistry and that they should be interested in its plans and problems.

What about compulsory health insurance? This subject has been before the health professions and the public for some time, and there is little need for me to dwell upon it at length. The opinion seems to prevail that bills in Congress providing for compulsory measures have little possibility of passing during this session. They are, however, still before the Congress, and we, as a profession, must be alert and ready to use our influence to prevent their passage.

The American Dental Association, on numerous occasions, has gone on record as opposing all forms of compulsory health insurance. The Association recognizes the need for more research and education and more prevention of dental disease, and also the need for other means of promoting dental health care of our people. It has plans for local and community health programs to bring these things about. The Association is opposed to a system of federal compulsory health insurance because it is not a practical and scientific approach to the problem. It will oppose all bills which attempt to federalize the health services. It is interested in improving health standards by scientific research and education and application of measures of prevention and control.

Compulsory health insurance, together with other socialistic tendencies, will result in a further increase of autocratic power, granted to centralized government, to interfere in the private affairs of citizens and to regulate their daily lives, and will further curtail their freedom and liberty. It will create another huge federal governmental agency with costly administration.

We should keep in mind that dental needs and service are, first of all, problems of the individual. If these needs cannot be met by the individual it becomes a community problem and then that of the state. Only when the state cannot meet the health needs of its citizens adequately should the federal government assume such obligation.

It is well to remember that no other nation in the world has been able to provide a standard of dental care comparable to that achieved in this country under the system of private dental practice, and probably in no other country has so large a percentage of the population received adequate dental care. There is, of course, still room for improvement in a further extension of this service, particularly among children.

In one of our states, provision has been made, by statute, for the permission of dental hygienists, upon completion of a special course, to fill cavities and to extract teeth for children. Legislation of this kind will undoubtedly have a tendency to break down legal safeguards which have been established for the public health and welfare. It will result in sublevel dentistry and will probably be a forerunner of similar legislation, making it possible for other

groups, insufficiently and inadequately trained, to assume the duties of the dentist. We should oppose legislation of this type since it will eventually mean the lowering of dental standards.

To the person who is not familiar with the problems of orthodontic teaching and practice, it probably seems that there is much confusion amongst the practitioners of this specialty. I am sure that, very often, we, too, feel that such may be the case. Our diagnostic methods differ to a great extent, and there is, in many instances, no unanimity of opinion regarding the advisability of treatment under given conditions, or when and how our treatment should be undertaken. We differ in our concepts of what our final results should be, and we differ in the selection and use of mechanical appliances used in our treatment.

Differences of opinion amongst our members may be a healthy sign and may be evidence of progress in the specialty. We should welcome such differences both in our sessions and in the pages of our JOURNAL. They are present in practically all professional groups and often cause us to change our accepted methods and procedures. It is not necessary and probably not advisable that our differences be entirely eliminated. They should, however, be recognized and respected and an honest effort should be made to overcome them. There should be a gradual lessening of these differences and misunderstandings and our experiences should have a tendency to bring our thoughts and ideas closer together, and we should come to a better understanding of our common problems.

While we may differ in our ideas and opinions and there may be variations in our methods of treatment, it should be remembered that we are all working toward the same end in our practices, namely, the best possible service for our patients, as we think it should be. We should then, at all times, be tolerant of the ideas and procedures of other persons with which we may not necessarily be in agreement. As professional persons we should be able to differ on friendly terms and should be willing to admit our shortcomings and lack of knowledge. Let us be charitable in our criticism of those whose views and opinions are not the same as ours. Let us have a more sympathetic understanding of the viewpoint of others. Let us remember, too, that criticism of a fellow practitioner may, in the mind of a patient, be a criticism of the specialty itself, and that we should make every reasonable effort to guard the standing and reputation of our fellow members and of the specialty. Unfavorable criticism may have a tendency to put us all in an unfavorable light before the public and may cause our honesty and sincerity to be questioned. It is well to remember that, to a large extent at least, we criticize because we do not know.

The foregoing statement should, of course, not be understood to mean that we may and should not be critical of our own ideas and procedures and those of our fellow practitioners. We should always maintain a critical attitude toward all phases of our specialty, and we should at all times observe an attitude of doubt regarding accepted teaching and practice. It should mean, however, that in our relations with our fellow practitioner we should not

criticize his actions, his methods of practice, or the result of his treatment without having information regarding the circumstances surrounding such action or treatment. It means that we should avoid unjust criticism at all times and that we make every effort to play the game according to the rules adopted in our code of ethics.

Since the meeting of this Association a year ago we have suffered the loss of twelve of our members by death. In the death of these persons the Association has lost esteemed members and many of us have lost dear friends. We shall miss them at our annual sessions. We mourn their loss and we extend our deep and sincere sympathy to the members of their families. Suitable resolutions upon the death of these members will be introduced by the Necrology Committee.

May I take this opportunity to express my thanks and appreciation to the members of the various committees for their efforts in helping to promote the object for which this Association was formed. They have carried out the duties assigned to them in the bylaws and they deserve the thanks of the members for their valuable and unselfish service. I am especially grateful to the members of the program and local arrangements committees. The members of these committees have been tireless in their efforts to provide not only a fine essay and clinic program, but they have also arranged entertainment and facilities for our comfort and enjoyment which I am sure we all appreciate. The names of the various committee members are listed in the program, and I am sure that a word of commendation would not be out of order.

To the officers of the Association I want to express my gratitude for their helpful advice and counsel during the year. It has been a pleasure to have been associated with them, and I am indebted to Dr. Joseph Johnson, President-Elect, Dr. Sergio Giquel, Vice-President, and to Dr. George Moore, Secretary, for their fine cooperation. We are fortunate indeed to have such an efficient and capable secretary. His advice and assistance have been a great help to me and I am very grateful to him.

I want to extend the thanks and appreciation of the Association to the essayists and clinicians whose efforts have made this fine program possible. We are grateful to those persons, not our members, who are appearing on the program. They are bringing us the results of their valuable experience and we are indeed fortunate to have them with us.

The Edgewater Beach Hotel has been most cooperative in making necessary arrangements for this meeting, and we appreciate the interest of the management in their efforts to make our meeting a success. This is our tenth meeting at this hotel, and the relations between the Association and the hotel have always been most pleasant and satisfactory.

I extend a most hearty welcome to the guests who are in attendance at this meeting. A very special welcome is extended to the persons who have come from foreign countries. It is our sincere hope that they will find the meeting interesting and instructive and that they will take back the best wishes of our members to the members of their Associations when they return to their homes.

In closing, may I again express my gratitude to the members for the privilege of serving as president of this fine Association during the past year. It has been an interesting and happy experience and one that I shall always remember and shall look upon with a great deal of pleasure.

I wish for the Association continued progress and growth. With understanding and harmony amongst the members, I am sure that the Association will advance the science and art of orthodontics, encourage and sponsor research, strive for higher excellence in orthodontic instruction and practice, and will contribute its part in health service.

LOWRY MEDICAL ARTS BLDG.

THE IMPORTANCE OF THE TONGUE IN THE DEVELOPMENT OF NORMAL OCCLUSION

D. Robert Swinehart, A.B., D.D.S., Baltimore, Md.

THE orthodontic profession, in order to advance as a scientific health service, must devote itself to the study of etiology, not only to improve corrective procedures, but also to prevent malocclusion. This report is not being presented to show a different mechanical technique. Instead, its purpose is to set forth evidence which seems to have etiologic significance.

It is a fact that crowding in the arches plays a part in a great percentage of the malocclusions we see today. Many such irregularities trace their etiology to loss of mesiodistal dimension through early removal of deciduous teeth and similar interferences. Others may be caused by requirement of the arches to accommodate teeth which are too large for the bone structures which underlie them. Pernicious habits, deep overbite, and displaced opposing teeth also play their part.

The clinician will certainly recall few cases in which much crowding of the mandibular permanent incisors existed, as having corrected themselves spontaneously. Eby[1] called attention to the fact that chronologic age does not always concur with physiologic age. Also, Lewis[2] stated that most of the increase in space for the mandibular permanent incisors occurs during the eruption of these teeth. It is generally believed that the space which becomes available after this process is notably small. The studies of Black[3] set forth the fact that in the mandible the average combined width of the deciduous canines and molars ordinarily is greater than that of the permanent canines and premolars by 1.7 mm. However, Broadbent[4] demonstrated a typical forward migration of the permanent molars upon exfoliation of the second deciduous molars. Nance[5] found that any space which might be gained for the anterior teeth by the interchange of smaller for larger buccal teeth is eliminated by this migration in most cases.

There are, however, numerous instances of crowding, with attendant abnormality of the arches, where none of the etiologic factors mentioned in the second paragraph can be definitely shown to be at fault. Moreover, these malformations transcend classification lines and often appear regardless of the accompanying conditions. For example, it is sometimes noticed that in both deciduous and permanent dentures, the mandibular teeth do not utilize the full amount of basal bone available to them. The buccal teeth, and occasionally the anterior teeth, are found inclined lingually to an abnormal degree, with crowding as a result. It becomes evident, therefore, that in this important phase of

This thesis was written and submitted to the American Board of Orthodontics in partial fulfillment of the requirements for certification, Dec. 15, 1948.

This article was read before the American Association of Orthodontists, Chicago, Ill., May, 1950.

the general malocclusion, there are still other factors which contribute to the deformity.

Orthodontists agree that the tongue in habitually abnormal movement can cause a variety of malocclusions. It has been the general concept that when pernicious habits of the tongue do not exist, that organ has a more or less passive effect upon the denture. The belief has often been expressed that after the arches are formed by innate growth processes, the tongue on the interior and the lips and cheeks on the exterior provide a balance of forces to maintain given forms of the denture, whether normal or abnormal. Although universal acknowledgment is made of the power of the tongue to misshape the arches, little concerted study has been devoted to determine whether the tongue is an important factor in forming the arches originally.

It might seem that the teeth assume their positions in accordance with the same processes of innate growth which govern the size and form of the basal bone. A clear analysis of the problem, however, will bring out the fact that the actual arrangement of the crowns of the teeth into dental arch forms must be accomplished to a great extent by other natural forces.

It has been well established that the bone of the basal portion of the mandible continues to grow to a predetermined size and form, along with the other bones of the body, largely guided by hereditary factors. Of course, trauma, endocrine disturbances, and ankylosis of the temporomandibular joint can impede the process but, given proper function and freedom from such interferences, the basal bone of the jaw evidently completes its development according to the plan mapped out by the genes. The development of the body of the mandible apparently is independent of the teeth it bears. It has been noted that even complete anodontia is not a deterrent to full mandibular growth.[6]

On the other hand, it must not be forgotten that the teeth are parts of the exoskeleton and, as such, are subject to their own peculiar system of development and growth. While the teeth are still in their crypts, the basal bone may be considered as the initiator of arch form. When the crowns of the teeth erupt away from the basal bone and into the oral cavity, however, the direct influence this bone holds upon the crowns is greatly diminished. The alveolar process is recognized as merely a bone of adaption, existing only to give support to the teeth in whatever positions they may occupy in the mouth. It is not believed that the alveolar process possesses the property of expansive growth, by which it could carry the crowns of the teeth to new locations or widen the arch. Evidently from the time of eruption on, the environmental muscular forces become important factors in the development of individual arch form. Consequently, it is logical to believe that the forces of the tongue are largely responsible for maintaining or increasing arch dimension toward the exterior. This independently developed and independently acting muscular organ is situated inside the denture. It is capable of exerting, upon the lingual surfaces of the teeth, forces ideally designed to shape the arches to its individual form and pattern of action. The rare instances of true macroglossia are easily recognized. Microglossia cannot be so readily detected but may be considered as of similar infrequency in occurrence.

It is obviously impossible to discuss at this time the entire subject of the relationship between tongue action and denture development. This report will hereafter be confined to consideration of the conditions noted and changes observed in the mandibular arch only.

The normally functioning tongue exercises its greatest influence upon the teeth during deglutition, which is carried out many times a day and almost always with the same pattern of movement. Investigation reveals that in cases with well-developed mandibular arches, the tongue is withdrawn to the floor of the mouth as the initial act of deglutition. In this position, the tip and borders of the dorsal portion rest against the lingual surfaces of the mandibular teeth. The tongue then expands against the buccal teeth. Following these original movements, the dorsum of the tongue curves upward, contacting, in sequence, the maxillary incisors and the palate from before backward. The food, which has thus been forced back along the palate, is further driven on through the isthmus of the fauces as the posterior portion of the tongue is raised.

In contrast to this normal action, it is apparent that many individuals possessing constricted dental arches display patterns of tongue motion which are quite different in their relationship with the teeth. Here the tongue cannot rest within the mandibular dental arch and operates in a higher position during deglutition. The tip and lateral edges of the tongue are held above the line of occlusion of the maxillary and mandibular teeth. The tip is then placed against the maxillary incisors and the palate just posterior to them, whereupon the after-portions of the tongue are raised in sequence against the palate. Expansive force is minimized, even upon the maxillary buccal teeth, since the vault of the palate is used as a trough, within which the tongue is rocked. Thus, the mandibular teeth fail to receive the normal amount of the pressure which is so necessary to development. The vital function of swallowing is served, but the companion effect of arch formation is diminished. Knowledge of the adjustability of the tongue makes it reasonable to assume that there are many individual variations in this abnormal pattern of tongue action.

The reasons behind this abnormal type of lingual movement are often obscure. In some cases, faulty nursing, pressure, and sucking habits may be postulated. In these, the tongue, being drawn away from its usual station, fails in its duty of guiding the canines and posterior deciduous teeth in the mandible to proper position and of maintaining them against buccal pressures. Whatever the primary cause, once the malformation has been established in the deciduous dentition, the well-known adaptability of the tongue prevents resumption of its proper location. As normal facial growth continues, the basic skeletal structures enlarge. The tongue also increases in size but, functioning in its abnormal position, is unable to provide all the necessary anterior width for accommodation of the permanent incisors. Furthermore, it cannot supply sufficient expansive and guiding force for the buccal permanent teeth as they erupt.

Rogers,[7] who pioneered myofunctional therapy, recognized the value of the tongue as an expansive force when the dental arches show lack of development toward the exterior. He designed an exercise, to be used in conjunction with the

masseter-temporal exercise, wherein the tongue is forcibly expanded laterally and anteriorly against the mucous membrane adjacent to the mandibular teeth. The excellent results achieved by this regimen attest to the importance of, and need for, proper and sufficient tongue function, if normal occlusion is to be attained.

On the theory that natural reinforcement of lagging arch form development might be provided by establishment of normal tongue function during the important phase of mixed dentition, a plan of treatment was instituted. In order to supply the opportunity for the tongue to relocate itself so that it could function to best advantage, a somewhat unusual appliance was utilized (Fig. 1). This consisted of a modification of the Mershon lingual arch, differing from the usual form in that it did not follow the lingual surfaces of the mandibular teeth. Instead, it dropped abruptly at the center of the first deciduous molars, the anterior section being well below the usual area of contact between the tongue and the anterior teeth. Spurs, attached to the banded second deciduous molars, passed distally to rest against the lingual surfaces of the permanent first molars.

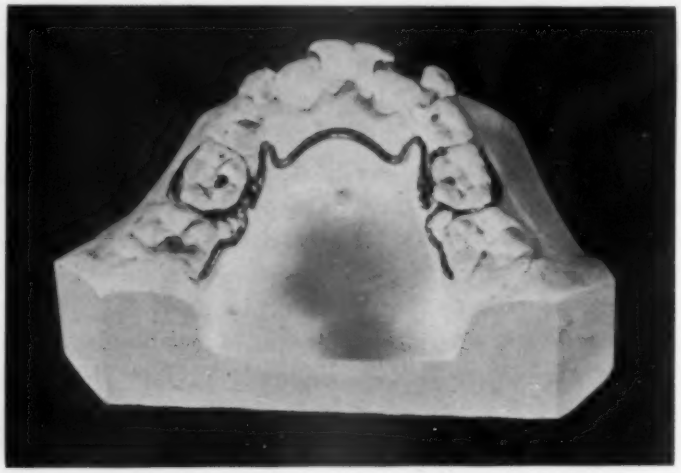


Fig. 1.—View of low lingual appliance.

This appliance was gradually expanded in conjunction with a similarly operated high labial arch with stationary anchorage on the maxillary second deciduous molars, with lingual spurs extending to the first deciduous and first permanent molars. In this way, sufficient width was provided to allow the settling of the tongue down between the mandibular posterior teeth. In all cases, the mandibular intercanine width began to be increased. In conformity with this, marked tendency toward automatic incisor alignment was noted. Not all cases received perfect individual arch form, but all were improved, regardless of the class of malocclusion and the depth of incisor overbite. However, Class II, Division 1 cases and those in Class I with protrusion of the maxillary incisors were found to be the most favorable. The maxillary deciduous canines were mechanically expanded, if they appeared to be obstructing growth in the mandibular area.

It should be emphasized that none of these mandibular anterior teeth was touched in any way by an appliance until after it was felt that the maximum natural benefit had been received, and then only to make minor adjustments or to aid in treatment of other phases of the general malocclusion.

It is not of primary consideration that all cases did not fully attain the required arch width and normal alignment. The significant fact is that there was prompt and universal improvement in these respects, regardless of other abnormal conditions in the denture.

A total of 40 cases of general malocclusion, chosen on the basis of insufficient space in the mandibular anterior region, presumably due to lack of normal developmental force of the tongue, were treated in this manner. The deficiency in intercanine space was definite in all cases, being so severe in some that room existed for only three permanent incisors. Narrowness of the arches, with lingual inclination of deciduous and permanent molars, was associated with the abnormal anterior conditions. None of the cases had been mutilated by premature loss of posterior teeth, but several lacked one or both mandibular deciduous canines. These spaces were partially closed by the customary distal drift of the incisors.

Of the 40 cases, 27 presented Class I malocclusion, and 13, Class II. Normal overbite was present in 10 cases and anterior open-bite in 3. Deep overbite occurred in 27 or about two-thirds of the cases.

Of the total, 26 cases still under treatment for other phases of malocclusion are grouped according to ages at inception of treatment. The remaining 14 comprise a group of completed cases. It must be made clear that the low lingual appliance therapy was but the initial phase of the general treatment plan, whatever the type of case. With the exception of four cases, it was instituted during the period embraced by the ages of 7 and 9, as, physiologically, that seemed the most reasonable time to stimulate growth which was obviously lagging.

During operation of the lingual appliance, no other aspect of treatment was carried on, at least in the mandibular arch. Thus the therapy was ideally suited to the mixed dentition, when ordinary treatment may be rendered ineffective by tooth succession. Furthermore, it was reasoned that encouragement of normal tongue action at this stage might obviate the need for later correction of permanent canines and premolars.

All cases treated received expansion in the second deciduous and first permanent molar areas. This was done gradually for the period of approximately one year. The criteria as to the amount of width desired were the original relative narrowness of the individual arches and the requirements of the tongue as to space in which to lie between the mandibular molars.

The length of time during which the low lingual arch was in place also varied with the individual. In certain cases the interval was short—where the lack of space was not severe, where response was rapid in incisor alignment, or where the second deciduous molars were lost early. In other cases the appliance was kept in use for a greater period—where the response was slow, indicating that the tongue action had not quite become normal, or where lingual inclina-

tion of the posterior teeth had been considerable. In such instances, once the optimum expansion had been achieved, no further pressure was applied, but the lingual arches were left in place for the purpose of retention.

Lewis[8] reported spurts in the increase of intercanine width, followed by periods of relative quiescence, which were peculiar to the individual in development of the untreated dentition. These were unrelated to the age or general skeletal growth of the individual, occurring at various stages, during eruption of the teeth. However, in the cases under discussion in this paper, an increase of incisor space invariably became evident after considerable posterior expansion had been made. Simultaneously, spontaneous improvement of incisor irregularity was noted. Moreover, the alignment followed a natural curve, in accordance with the individual arch form.

Of importance among the results noted during treatment was the fact that individual response varied considerably. Not all cases responded at the same rate, even within the same age group, nor did they increase in the same amount. Obviously, tooth size had some bearing in this matter, but the fact was that no more than the correct amount of space required for normal tooth alignment was achieved, even though some cases gained more than twice as much as others. Permanent canines and premolars were seen to erupt in more favorable positions than those their predecessors had originally occupied. Despite the large increase in dental arch dimension in some cases, in no case did the teeth aligned by spontaneous tongue pressure give evidence of being beyond normal osseous support, or out of harmony with the forces of the lips and cheeks. Corroboration of this was seen in the degree of stability displayed by the completed cases.

Measurement of the cases treated was based on the systems used by several men who did research work in the field of arch development. For determination of the mandibular intercanine width, the method of Lewis and Lehman[9] was used. They measured the distance from the embrasure between the canine and the first deciduous molar at the contact point. From the standpoint of accuracy in arch width, Cohen[10] found the most consistently stable landmarks in both deciduous and permanent posterior teeth to be the points of the mesiolingual cusps.

These investigators studied groups of children who presented relatively normal occlusions. The cases examined in this paper, however, all displayed distinct forms of malocclusion with crowding of the mandibular anterior teeth. Thus, as a group, they should not be expected to agree in arch width, form, or development with those reported upon in the studies mentioned, but it was felt that some basis of comparison in these matters would be interesting.

Lewis and Lehman examined children from the ages of 2 to 8½ and attempted to determine a trend in growth. They showed the total mean increase in the mandibular canine region to be 2.40 mm. from the age of 2 to 8½ and found that the greatest mean width increase in the deciduous dental arches appeared between the ages of 6 and 8½ years.[11] In a later paper, Lewis[12] stated, "Between 9 and 10½ years there is another plateau followed by another spurt, which reaches a maximum at about 13 years."

Cohen[13] followed a group of 28 children from the ages of 3½ to 13½ years. They were selected originally on the basis of fairly normal development, but irregularities were found to develop at later stages in some. He found that in the mandible, "There seems to be little lateral growth in the molar region and in the region of the second deciduous molar. A little growth appears between the ages of about 6 and 10 in the first deciduous molar region, but a consistent and definite growth period appears in the cuspid region between the ages of 5½ and 8½ (2.5 mm.), or during the period in which the lower permanent teeth are erupting. After the nine-year period, there seems to be no lateral growth in the cuspid area in either boys or girls. Until the age of 10½ the curve closely follows the findings of Lewis, but, from then on, his subjects developed another spurt in growth, while ours showed no further lateral development in the cuspid area."[14]

TABLE I. DIMENSIONAL CHANGES IN THE MANDIBULAR DENTAL ARCHES OF THE 8-9-YEAR AGE GROUP

CASE NO.	AGE	CLASS	OVERBITE	WIDTH AT BEGINNING OF TREATMENT (MM.)		WIDTH 3 MO. AFTER LOW LINGUAL APPL. REMOVED (MM.)		GAINS (MM.)	
				CANINES	SECOND DEC. MOLARS	CANINES	SECOND PRE-MOLARS	CANINES	PRE-MOLARS SECOND
1	9	1	Normal	23.5	28	29	32	5.5	4
2	8	1	Deep	28	27	32.5	32	4.5	5
3	8	1	Deep	29	30.5	33	35	4	4.5
4	8	1	Deep	25	30	28.5	33	3.5	3
5	8	1	Deep	26	28.5	30	34	4	5.5
6	8	1	Deep	26	28	31	34	5	6
7	8	1	Open	26	28	28.5	32.5	2.5	4.5
8	8	2	Deep	25.5	27	30		4.5	
9	9	1	Deep	27	29.5	33	34.5	6	5
10	9	1	Normal	25.5	28	30		4.5	
Averages:				26.15	28.69*	30.55	33.38	4.40	4.69

*Only cases having second premolars at the time of second measurement were used in calculating this average.

Table I shows a group of cases which received the low lingual arch therapy beginning at the ages of 8 and 9. It will be seen that whereas the measurements of Lewis and Lehman[15] would lead us to expect a mean width in the mandibular canine region of approximately 28 mm., the average here was 26.15 mm., one being as low as 23.5 mm. From this and the marked crowding of the incisors it was evident that the arches had received less than average growth, and, according to Cohen, had no prospect of receiving it in the future. Furthermore, in the second deciduous molar area, Cohen[16] found an average width at this age of 30.4 mm. The cases under discussion averaged 28.69 mm., indicating here also that the developmental process was falling behind requirements.

It will be noted from the table that remarkable increases in width in both areas were achieved following the lingual arch treatment. While in a few cases the appliances were in place for as long as two and one-half years, it must be remembered that the active expansion period in all cases was approximately one

TABLE II. DIMENSIONAL CHANGES IN THE MANDIBULAR DENTAL ARCHES OF THE GROUP OF COMPLETED CASES

CASE NO.	AGE	CLASS	OVERBITE	WIDTH AT BEGINNING OF TREATMENT (MM.)			WIDTHS 1-5 YR. AFTER ALL ORTHODONTIC CORRECTION AND RETENTION COMPLETED (MM.)			GAINS (MM.)		
				CANINES	SECOND DEC. MOLARS	FIRST PER. MOLARS	CANINES	SECOND PRE-MOLARS	FIRST PER. MOLARS	CANINES	SECOND PRE-MOLARS	FIRST PER. MOLARS
1	8	1	Normal	25	24	29.5	27.5	30	34	2.5	6	4.5
2	6½	1	Normal	23	25	29	30	31	33	7	6	4
3	8	1	Normal	28	29	33	32	33	36	4	4	3
4	9	1	Deep	27	29.5	34.5	33	34	38.5	6	4.5	4
5	8	1	Deep	24.5	29	31.5	28	32	35	3.5	3	3.5
6	7	1	Deep	24	25	26.5	30	33.5	33.5	6	8.5	7
7	7	1	Deep	26	27	32	30	30	35	4	3	3
8	7½	2	Deep	26	24.5	30	28	29	34	2	4.5	4
9	8	2	Deep	26	29	35	30	33.5	37	4	4.5	2
10	6½	2	Deep	24.5	27	27	29.5	33	34	5	6	7
11	6½	2	Deep	24	27.5	32	30	31	34	6	3.5	2
12	6½	2	Deep	26	30	34	33	34.5	40	7	4.5	6
13	8	1	Deep	29	30.5	36	33	35	40	4	4.5	4
14	7	1	Open	26	29	32	31.5	36	40	5.5	7	8
Averages:				25.64	27.57	31.57	30.39	32.54	36.0	4.75	4.97	4.43

year or less. The average gain in intercanine width in this age group was 4.40 mm. This was at a time when Cohen's studies of untreated cases show an end to growth and those of Lewis and Lehman a leveling off.

Those cases in which second premolars had succeeded both second deciduous molars were measured in width. These premolars, having never received direct influence from the appliance, were utilized to indicate the regional gain. The average increase in width in the second premolar area is shown to be 4.69 mm., one case attaining a gain of 6.0 mm.

Table II lists the 14 cases in which all orthodontic treatment had been completed. Intended for comparison with the previous table, it differs only in that the final measurements for canine, premolar, and first permanent molar areas were taken from one to five years after removal of all appliances and retention, if the latter had been used at all.

TABLE III. DIMENSIONAL CHANGES IN THE MANDIBULAR DENTAL ARCHES OF THE 7-YEAR AGE GROUP

CASE NO.	AGE	CLASS	OVERBITE	WIDTH AT BEGINNING OF TREATMENT (MM.)		WIDTH 3 MO. AFTER LOW LINGUAL APPL. REMOVED (MM.)		GAINS (MM.)	
				CANINES	SECOND DEC. MOLARS	CANINES	SECOND PRE-MOLARS	CANINES	SECOND PRE-MOLARS
1	7	1	Normal	27	29	31	33	4	4
2	7	1	Normal	26	29	29.5	33	3.5	4
3	7	1	Normal	26	26.5	30	32.5	4	6
4	7	2	Deep	26.5	29	33	34	6.5	5
5	7	2	Deep	26	25.5	29		3	
6	7	2	Deep	27.5	31	31	34	3.5	3
7	7	2	Deep	25	31.5	29.5		4.5	
8	7	2	Deep	25	26.5	30.5	33	5.5	6.5
9	7	2	Normal	27	29	30	33.5	3	4.5
Averages:				26.22	28.57*	30.39	33.28	4.17	4.71

*Only cases having second premolars at the time of second measurement were used in calculating this average.

Whereas the average intercanine width in the 8- and 9-year-old group was 26.15 mm., the width in Table II was 25.64 mm. The former gained 4.40 mm. to a final average of 30.55 mm., whereas canines in the completed cases gained 4.75 mm. to stand at an average width of 30.39 mm. This would indicate that the advantage gained in the process of this treatment is not a temporary thing and that the tongue, given the opportunity to operate normally, continues in its intended role of producing and maintaining arch form.

In the deciduous second molar areas, the 8- and 9-year-old group averaged 28.69 mm., and the second premolars erupted with an average width of 33.38 mm., showing a gain of 4.69 mm. The same region in the group of completed cases, beginning at a mean width of 27.57 mm., increased by 4.97 mm., the second premolars remaining at an average distance of 32.54 mm.

The average distance between the first permanent molars, according to Cohen,[17] increased less than a millimeter from the time of eruption until the age of 13½, when it was approximately 36.0 mm. At the time treatment was

begun, the same measurement for the completed group showed only 31.57 mm., one being but 26.5 mm. Even though a definite mechanical expansion of these teeth took place, their average distance eventually stood at 36 mm. Thus, the area displayed a permanent gain averaging 4.43 mm., indicating that such was necessary for normal arch form and tongue action.

TABLE IV. DIMENSIONAL CHANGES IN THE MANDIBULAR DENTAL ARCHES OF THE 7½-YEAR AGE GROUP

CASE NO.	AGE	CLASS	OVERBITE	WIDTH AT BEGINNING OF TREATMENT (MM.)		WIDTH 3 MO. AFTER LOW LINGUAL APPL. REMOVED (MM.)		GAINS (MM.)	
				CANINES	SECOND DEC. MOLARS	CANINES	SECOND PRE-MOLARS	CANINES	SECOND PRE-MOLARS
1	7½	1	Normal	26	30	30	36	4	6
2	7½	1	Deep	27.5	29	31	34	3.5	5
3	7½	1	Deep	24.5	28	28	33	3.5	5
4	7½	1	Deep	24.5	26.5	28		3.5	
5	7½	1	Deep	28	29	32.5		4.5	
6	7½	2	Deep	26.5	27	30	33.5	3.5	6.5
7	7½	1	Open	27	28.5	30.5	32.5	3.5	4
Averages:				26.29	28.50*	30.0	33.80	3.71	5.3

*Only cases having second premolars at the time of second measurement were used in calculating this average.

Tables III and IV display the results obtained in treatment of groups beginning at the ages of 7 and 7½. They are left to the perusal of the reader and no comment will be forthcoming on them individually. Their averages, however, are of importance in Table V.

TABLE V. AVERAGES OF THE FOUR AGE GROUPS LISTED FOR COMPARISON

TABLE NO.	AGE GROUP	AVERAGE WIDTH AT BEGINNING OF TREATMENT (MM.)		AVERAGE WIDTH 3 MO. AFTER REMOVAL OF LOW LINGUAL APPL. (MM.)		AVERAGE WIDTH AT COMPLETION OF ALL TREATMENT (MM.)		AVERAGE GAIN (MM.)	
		CANINES	SECOND DEC. MOLARS	CANINES	SECOND PRE-MOLARS	CANINES	SECOND PRE-MOLARS	CANINES	SECOND PRE-MOLARS
I	8-9	26.15	28.69	30.55	33.38			4.40	4.69
II	Com-pleted	25.64	27.57			30.39	32.54	4.75	4.97
III	7	26.22	28.57	30.39	33.28			4.17	4.71
IV	7½	26.29	28.5	30.0	33.80			3.71	5.30

Table V is a composite of the findings in all the foregoing tables. It will be observed that at the beginning of treatment, the average intercanine width is remarkably similar in all age groups, deviating but slightly from 26.0 mm. Two conclusions may be drawn from the statistics. One is that, before treatment, a sufficient increase in width had not been forthcoming, during the years when acceleration of growth is persumed to be greatest. The other is that the mandibular permanent incisors had forced themselves into an irregular arrangement and so remained. It seems evident that, in these cases, other growth-producing factors were necessary to bring about full arch development.

Turning to the columns listing the final intercanine widths, it is notable that regardless of the age at which treatment was initiated, or the width at that time, all the unfinished cases show, at the end of the lingual arch treatment, an average close to 30 mm. Even the group of completed cases (Table II), which is composed of individuals whose treatment was begun at various ages, bears this out. Thus, the mean of 30 mm. reached by the cases receiving low lingual arch therapy suggests that such dimension might be considered as approximating average normal development.

While the comparison of changes brought about in the second deciduous molar area (Table V) is somewhat marred by the fact that some of the cases had not yet reached the age for eruption of the second premolars, the results are remarkably similar where the measurements could be made. It should be noted that the group of completed cases, although starting lower and finishing lower than most of the other groups in this respect, nevertheless showed the greatest gain. Moreover, the fact was that all groups became, on an average, at least 2 mm. wider than the 30.4 mm. tabulated by Cohen.[18]

Fig. 2.

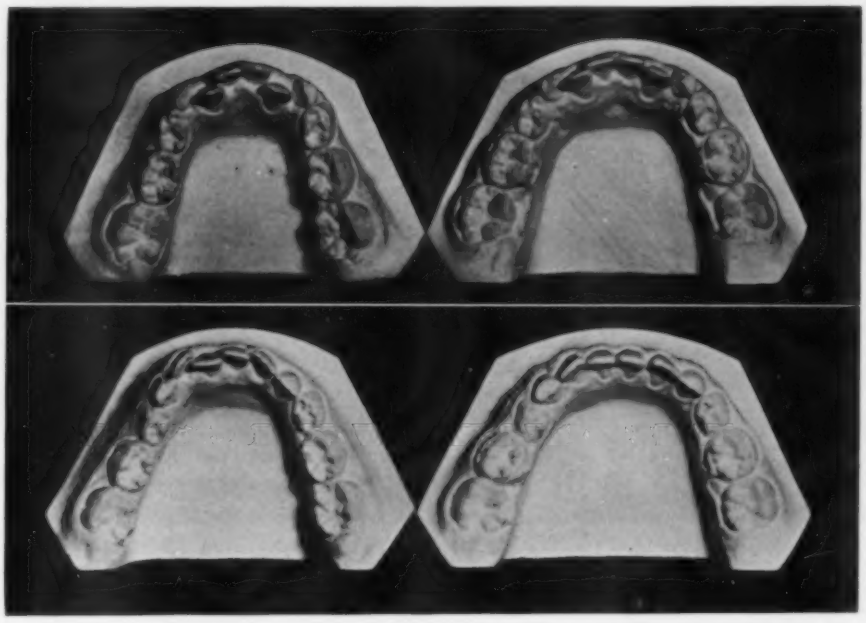


Fig. 3.

Fig. 2.—Casts made before (left) and after (right) thirteen months of treatment with the low lingual arch. The intercanine width has already gained 3.5 mm. from 24.5 mm.

Fig. 3.—The result of treatment for fifteen months. This patient gained 4.5 mm. in the canine area over the original width of 25.5 mm.

In view of these circumstances, the obvious conclusion is that corrected tongue action was an important factor in the improvement. If, on the other hand, it is thought that the required width would have been attained without such aid, why had it been so clearly failing during the normal growth period prior to treatment? Proper tongue function during the building of the dentition logically appears as a necessary natural force in production of the desired arch form.

Space will not permit detailed discussion of many interesting and convincing facts that are presented by the individual cases in these tabulations. Detailed study by competent orthodontists will undoubtedly disclose much information bearing upon the problems of treatment.

Visual evidence of the changes brought about may be more understandable than the statistics which have been presented. Figs. 2 and 3 represent the progress made in the deciduous dentitions of two young cases in a little over one year, under the low lingual arch therapy. Both originally displayed a mandibular arch form typical of the malfunctioning tongue. Note the severity of this as indicated by the concavity in the curves of the posterior segments and the lingual tipping of the molars. The deep overbite, present in both, has not been altered during the spontaneous anterior expansion and alignment which has occurred.

Fig. 4.

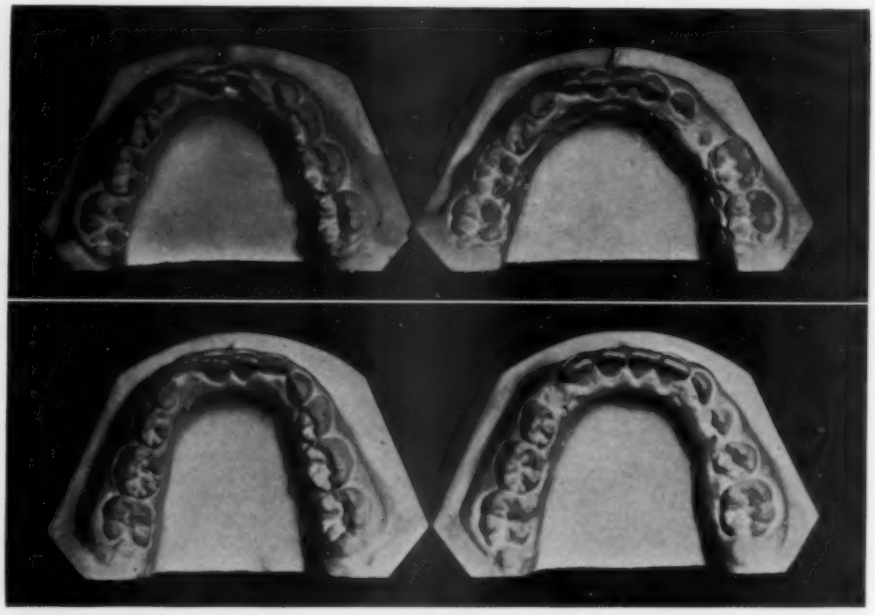


Fig. 5.

Fig. 4.—This patient received twenty-three months of treatment with the low lingual arch. The cast on the right was made at the time the appliance was discontinued. Note the excellent position of the erupting canine.

Fig. 5.—Casts showing conditions before (left) and after (right) fourteen months of lingual arch therapy.

Figs. 4 and 5 indicate the same progress, and are shown to illustrate the normal placement of the erupting permanent canines and premolars after the tongue was permitted to make its normal expansive influence felt. It is extremely doubtful that these teeth would have followed this course without such aid. With one permanent canine erupting, a 4.5 mm. gain was evident in the case of the patient shown in Fig. 4. Attention should be called to the fact that in the foregoing illustrations, the marked width increase and spontaneous tooth adjustment in the anterior segment took place before the second deciduous

molars were lost. This was true in most of the cases treated. Thus, a favorable leeway in comparative dimension of deciduous and permanent buccal teeth could not have been responsible for the gain in incisor space. While it is true that expansion of the posterior teeth might allow for some adjustment of incisors, it should be obvious that it alone could not account for the substantial increase in intercanine width noted in these cases. In the other case (Fig. 5) comparative measurements cannot be presented, because the left permanent canine has not erupted, but it is obvious that good arch form will be attained.

Fig. 6.

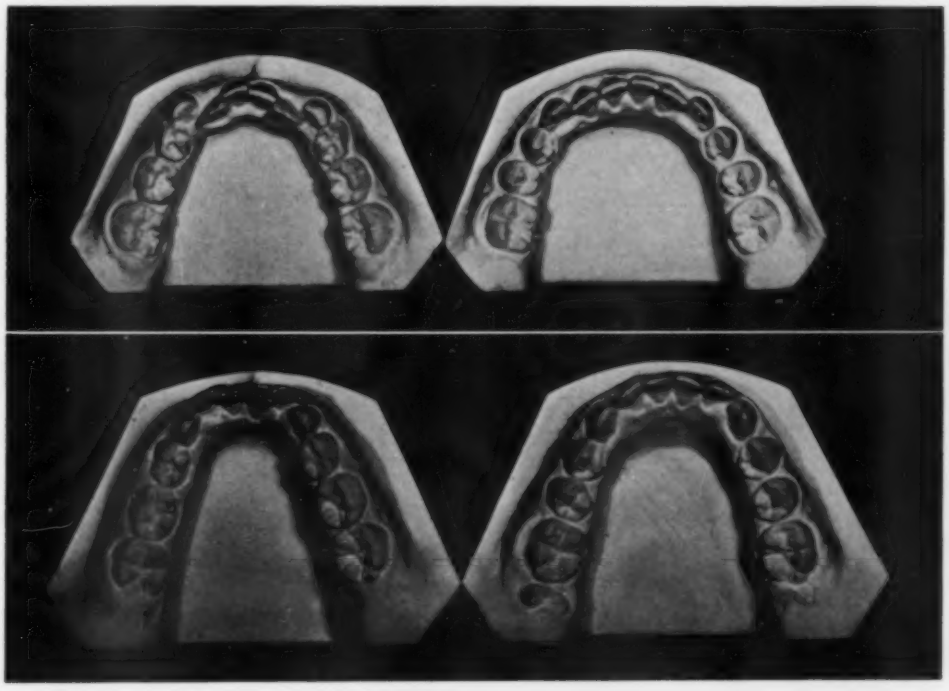


Fig. 7.

Fig. 6.—Left, case of girl aged 7½. Right, after two years of low lingual arch treatment. Class I, deep bite condition unchanged. Intercanine gain, 3.5 mm.; increase in width at second premolars, 5 mm.

Fig. 7.—Left, cast of boy 9 years of age having Class I malocclusion and normal overbite. Right, after twenty months of treatment with low lingual arch. Intercanine gain, 5.5 mm.; premolar gain, 4.0 mm.

The next pair of illustrations (Figs. 6 and 7) are representative of cases treated by the prescribed method and illustrate the complete replacement of the deciduous dentition. No teeth shown in the casts on the right have received adjustment by orthodontic appliances except the first permanent molars. While slight irregularities are present, it will be observed that the general alignment is good. It should be further noted that although the basic individual arch forms have been retained, the normality of each has been restored. It seems doubtful that mechanical predetermination could have achieved results equally as acceptable to the natural limitations of the individual oral cavities.

The next photograph (Fig. 8) shows a case in which the prognosis at 7 years of age was very doubtful due to the presence of large incisors and mark-

edly subnormal arch development. After improper tongue action was corrected, the patient gained 6 mm. in canine width and 8.5 mm. at the level of the second premolars. It seems improbable that this growth would have taken place without interference, so that extraction of permanent teeth would have been required in later treatment.

Fig. 8.

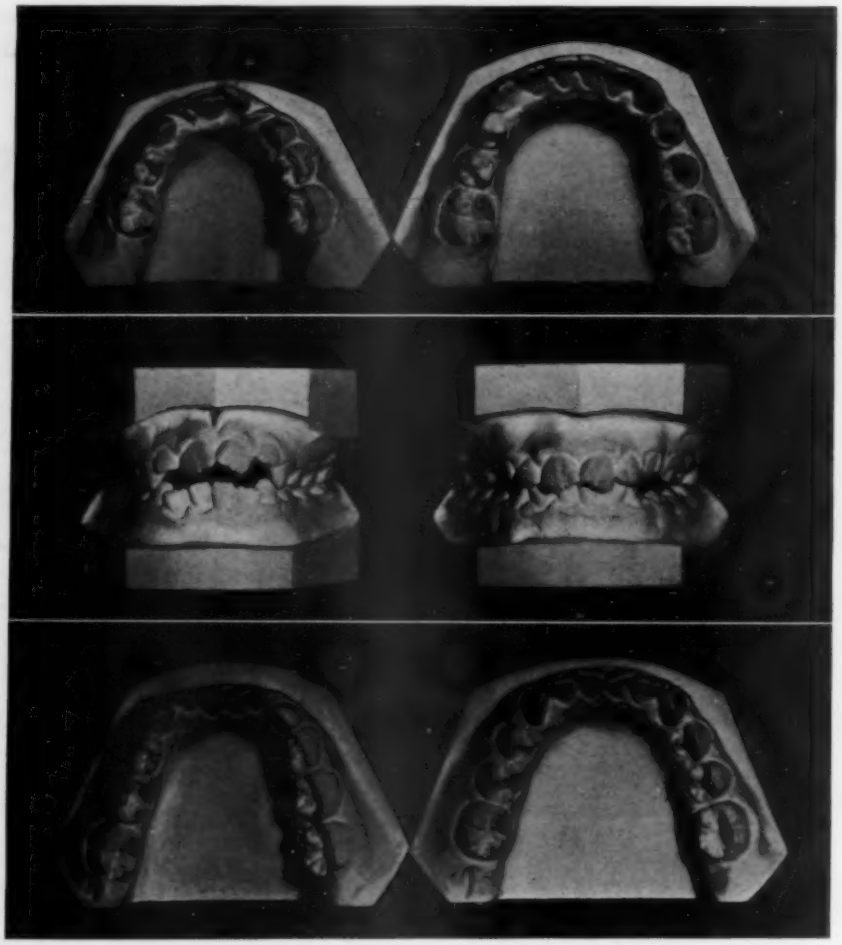


Fig. 9.

Fig. 8.—Remarkable development noted in girl who received thirty months of treatment with low lingual arch. Class I, deep bite. Intercanine gain, 6 mm.; second premolar gain in width, 8.5 mm.

Fig. 9.—Case in which abnormality of tongue movement could not be completely corrected, showing marked improvement in general, but inadequate results in detail.

Fig. 9 illustrates an abnormality of tongue action which exceeded that in any other case treated. It exemplifies the remarkable influence the tongue exerts upon the teeth by its simultaneous presence in abnormal locations and absence from normal locations. Here the habit of holding the tip of the tongue between the incisors during deglutition, resulting in their infraversion, also brought about reduction of the expansive force of the organ on the mandibular arch. Correction of the above habit by a maxillary lingual bar, followed by the routine expansion in the posterior of both dentures, brought about improvement. Note the postitions of the premolars, all of which peculiarly erupted at approxi-

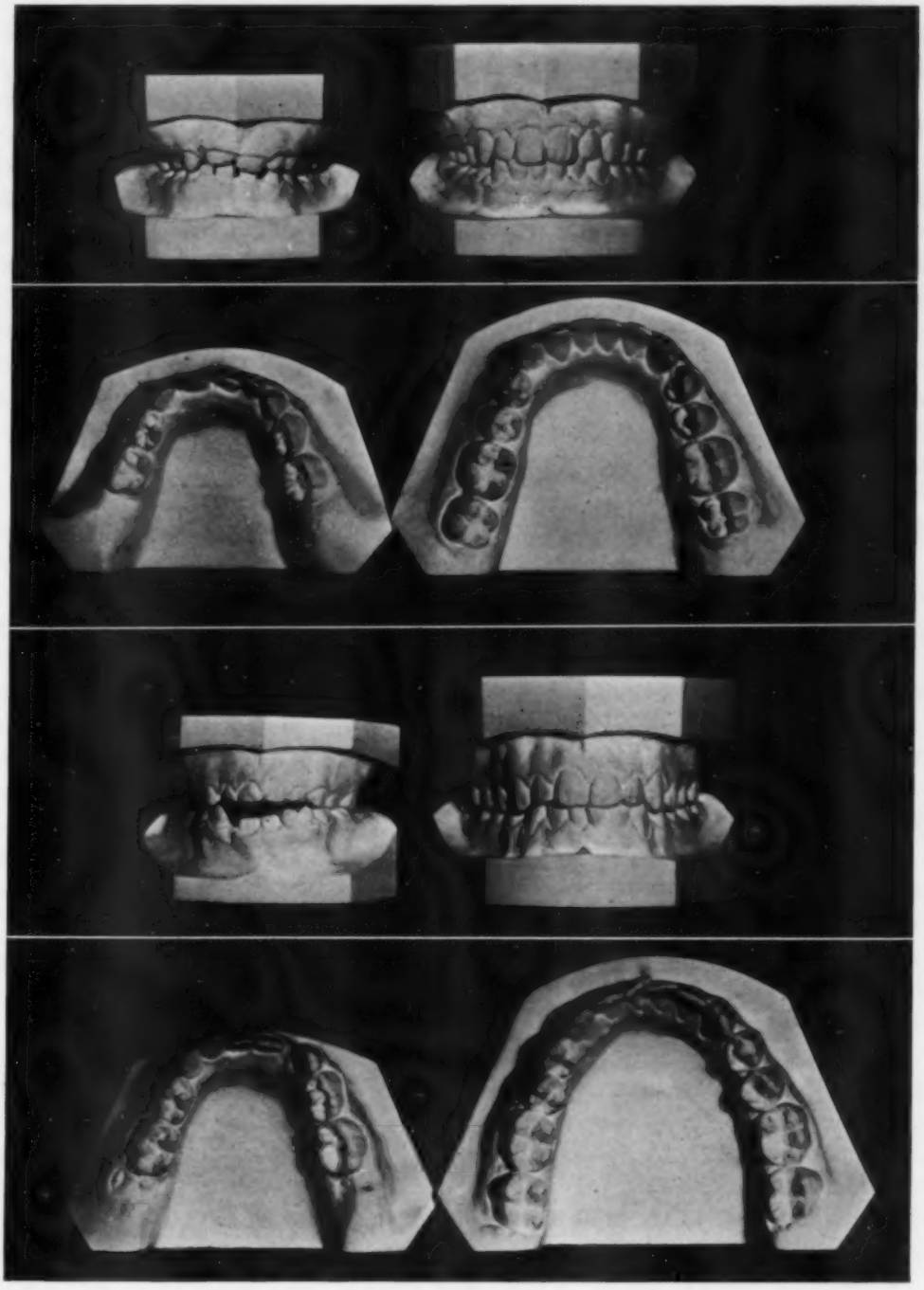


Fig. 10.

Fig. 11.

Fig. 10.—Comparison of original casts of boy (aged 6½) with those made five years after completion of all treatment. Gains: Canine area, 6.0 mm.; premolar, 3.5 mm. Upper: Occluded casts. Lower: Occlusal views of mandibular casts.

Fig. 11.—Comparison of original casts of boy (aged 7) with those made five years after completion of all treatment. Intercanine gain, 5.5 mm.; premolar gain, 7.0 mm. Upper: Occluded casts. Lower: Occlusal views of mandibular casts.

mately the same time. It seems probable that completely normal tongue action and arch form will never be achieved here, but it is possible to visualize the extensive malocclusion which would have resulted without early preventive treatment.

The next illustrations (Figs. 10 and 11) show casts of two cases before treatment and approximately five years following removal of all orthodontic appliances. Neither patient wore a retainer. It will be seen that the rotation of the mandibular central incisor in the final cast (Fig. 11) was unavoidable even with a short overbite, and was due to a discrepancy in the sizes of the anterior teeth of the two arches. However, it cannot be denied that the patient now has good arch form and occlusion.

It must be emphasized that the benefits to be derived from institution of proper tongue function cannot be expected if aid is not given long before adolescence. By that time, most of the permanent dentition is in place and the various malpositions consequent to the wedging of teeth into the deficient arch are present. Of greater importance, however, is the fact that, in the teens, the form, position, and action of the coordinating facial muscles and tissues have already been mostly matured on the basis of small, if irregular, dental arches.

That there is disharmony in the amount of tooth material in anterior segments of the two arches in some cases cannot be denied. It is also true that there are other cases in which the amount of basal bone is insufficient for accommodation of the denture in correct form. However, there are numerous cases in which these adverse conditions do not exist. Given the ability to establish permanently the correct arch relationship and depth of overbite, the encouraging fact is that a high percentage of unmutilated cases of the type described in this report will result in satisfactory arch form, if proper tongue action is established early.

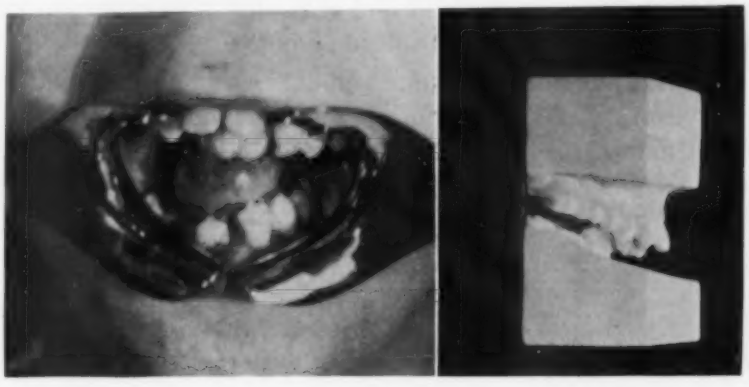
In supporting a theory as to the etiology of malocclusion, reasoning ordinarily must be based upon observation of conditions before, during, and after treatment. It is believed that these observations provide much evidence that lack of normal tongue forces during deglutition results in lack of normal mandibular arch development. If, then, an individual should possess no tongue, he should also present the ultimate in lack of mandibular arch development.

An extremely rare case of congenital aglossia was reported by Eskew and Shepard.[19] The patient was a 22-year-old man of Chinese descent. Previous to the examination, he had had several mandibular anterior teeth extracted, the number of which he did not recall. The report stated, "Clinical examination revealed the absence of a tongue, with no rudimentary structure resembling a tongue. The floor of the mouth was smooth and could be elevated to contact the incisal edges of the maxillary anterior teeth. . . . In the mandibular arch there is a premolar contraction of 16 mm., and a molar contraction of 11 mm. (using Pont's index as a norm). The mandibular central and lateral incisors and the right cuspid are missing. It was necessary to extract the left mandibular cuspid, due to an acute pericementitis caused by the shearing bite."

The following illustrations are reproduced from the original article through the courtesy of Dr. Eskew. Fig. 12, *A* shows how remarkably the tissues of the

floor of the mouth have adapted themselves to the unusual situation by attempting to assume the function of a tongue in deglutition and speech. It will be noted that the mound of tissue, when so raised, contacts the posterior teeth. The lateral view of the casts (Fig. 12, *B*), exhibits the great lack of harmony that exists between the arches.

As will be seen from the occlusal aspect in Fig. 13, the mandibular arch is miniature. It conforms in shape and size to that of the elevated tissues, which have no lateral expansive force in the posterior, and no forward thrust against the anterior portion of the mandibular arch. Thus the posterior portion of the arch is extremely subnormal, and the anterior section, ordinarily comprised of incisors and canines, is practically nonexistent. It is interesting to speculate whether any arch form would have been produced if the tissues of the floor of the mouth had not adapted themselves in this manner.



A. *B.*

Fig. 12.—Conditions present in a case of congenital aglossia. *A*, Oral tissues elevated in substitution for the tongue. *B*, right lateral view of casts, showing extensive malocclusion. (Courtesy of Dr. Eskew.)

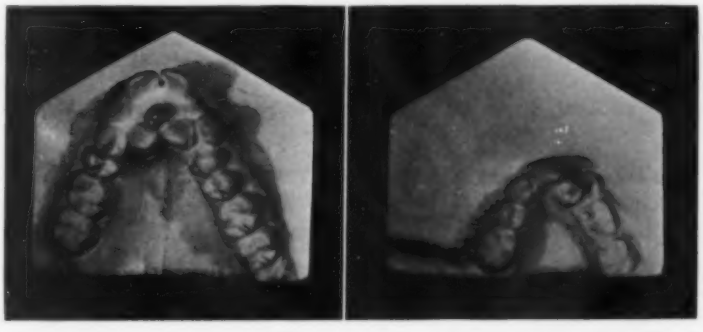


Fig. 13.—Occlusal views of casts, displaying extreme underdevelopment of the mandibular arch found associated with congenital aglossia. (Courtesy of Dr. Eskew.)

SUMMARY

1. Deficient mandibular arch form with irregularity of the incisors is a very common phase of malocclusion. Many instances of this cannot be accounted for by present theories of etiology.

2. The basal bone of the mandible tends to approximate hereditary form and size, if given proper function. It initiates arch form prior to eruption of

the teeth. In contrast, the teeth, as exoskeletal parts, have distinctly different laws of development and growth. After the crowns of the teeth migrate away from the basal bone into the oral cavity, the environmental forces there become potent factors in positioning the crowns of the teeth.

3. Normal arch form requires sufficient dimension to accommodate the teeth. The most important natural forces which can increase mandibular arch dimension are those of the tongue.

4. The normal expansive forces of the tongue are exerted to their maximum only when it can be accommodated within the mandibular arch. When the tongue, during deglutition, operates from a higher position, its expansive forces on the mandibular teeth are diminished.

5. Certain mandibular arches are too narrow to accommodate the tongue between the buccal teeth during deglutition. Following sufficient orthodontic expansion of the posterior portion of the arch, the tongue assumes its normal position and can exert its normal expansive forces.

6. If resumption of normal tongue action occurs early in the formation of the permanent denture, it results in marked growth in the mandibular arch. Arch dimension gained through the influences of normal tongue function tends to remain stable. The coordinating forces of the tongue, lips, and cheeks, when allowed to develop a proper equilibrium during the early stages of facial growth, usually maintain their balance.

7. The highly abnormal form and the diminutive size of the mandibular arch found associated with congenital aglossia provide proof of the vital importance of normal tongue form and function to normal occlusion.

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MEDICAL ARTS BLDG.

ANATOMY AND PHYSIOLOGY OF HEAD AND NECK MUSCULATURE

ALLAN G. BRODIE, D.D.S., PH.D., CHICAGO, ILL.

THERE would be little to be gained from a presentation under such a title if it were a mere repetition of descriptions available in textbooks. For too long a time we have been content to rest on such knowledge but recently there appears to be an awakening of interest in muscle; a refocusing of attention on certain of its characteristics other than that of its chemistry. Although the classical researches on muscular reactions of the last century have not been forgotten, they have been all but eclipsed by the interest engendered in the chemistry of contraction that flowered around the turn of the present century. Now, thanks to a reawakening in the field of physical medicine, the muscle is being studied as a part of the body rather than as a detached strand of tissue connected to a galvanometer. This makes it imperative to consider certain well-established principles of muscle tissue before attempting any correlations to our own field.

Certain properties of muscle are inherent to the tissue itself and certain of them are under the control of outside agencies, principally the nervous system. A muscle can be completely detached from the body and still exhibit reactions that proclaim its irritability. It loses certain other reactions as soon as its nerve supply is severed. We must be concerned with both types of response if we are to attempt either to include muscular considerations in our diagnoses or to manage them in our treatment.

The unit of muscle tissue is the muscle fiber and the fiber has certain characteristics not possessed by that collection of fibers which we call a muscle. When a muscle fiber is stimulated to a degree that calls forth any response it contracts to the fullest extent. We say it responds "all or none." It is either fully relaxed or fully contracted. A muscle, i.e., a collection of fibers, is, on the other hand, always partly contracted—at least while we are conscious. How can this apparent contradiction be explained?

Muscle fibers do not run the full length of a muscle but rather are interwoven with each other and connected through their sheaths. Certain of them are fully contracted in the normal resting muscle, thus imparting a slight degree of tension or shortening to the entire muscle. These fully contracted fibers fatigue, i.e., accumulate waste products, and other fibers go into complete contraction as the fatigued fibers relax and rebuild. This process maintains a state of partial contraction which is called tonus.

Voluntary muscle is always working against tension or load and if the tension is removed the muscle shortens. Thus, if a muscle is cut across its belly the two halves immediately retract. This explains the displacement of fragments following the fracture of bones. In the living body muscles are always working against some force, either the tensions of opposing muscles or gravity.

Another property peculiar to muscle is the stretch reflex. Although muscle may be considered an elastic tissue it cannot be compared strictly to a rubber band. In stretching the latter it is found that an equal degree of distention follows the application of each equal unit of force, whereas in a muscle the degree of distention decreases as the load is increased. This signifies that an increasing number of fibers is called into action with the addition of each equal increment of force. The same reaction explains the manner in which a muscle responds to the work to be performed. With a slight load, only a few fibers are summoned, but if the work is heavy more fibers respond.

Turning now to certain anatomical considerations we note great differences in the size of muscles, both in the matter of length and of girth. As a general rule the heavy muscle is a muscle of strength and endurance—capable of sustained work over long periods of time but not adapted to fast or extensive movement. The thin or spindly muscle usually indicates a greater range of movement and that with speed. It does not, however, possess the endurance that characterizes the former.

The arrangement of muscles in the body is according to the best engineering principles of energy conservation. The fullest advantage is taken of effective leverage and of the assistance available from gravity. This brings us to a consideration of certain principles that have direct bearing on orthodontic diagnosis and treatment, and we shall accordingly give them more detailed consideration.

The animal body is bilaterally symmetrical; the left side is a mirror image of the right so far as the skeletal and muscular structures are concerned. This can be seen in any dissection of the dorsal or ventral aspect and need not be enlarged upon here except to point out that such an arrangement results in equilibrium. At first thought such equilibrium might seem desirable but it must be remembered that objects in equilibrium require extra energy to move them. In our automobiles we are accustomed to the idea of a first gear to get us started but we get into high gear as fast as we can if we wish to save gasoline. The physicist refers to this process as disturbing the "moment of inertia," and he looks upon it as most wasteful of energy. For Man to move sideways requires the expenditure of muscular energy alone—he receives no help from any other source.

When we turn the body in such a way that the skeletal and muscular systems can be visualized from the side all impressions of equilibrium and stability vanish. We are looking now at one of the least stable arrangements that could be imagined. Eliminating the legs for a moment, consider the vertebral column. Here we find an arrangement of small bones, piled one on top of the other in the manner of so many spools. But no column, even of spools, could be so unstable because this column is not even straight but rather thrown into a series of curvatures. And, then, perched on top of the column, we find a globelike structure, the head, supported by two half-round pedicles, the condyles. But even this does not tell the complete story because this rickety arrangement is all set on legs that are not in the axis of gravity. What keeps such a structure erect? The answer is, of course, muscles.

The strongest muscles of the body are those which fight gravity. These are principally in the back and they act as check reins to prevent our pitching forward. It is a matter of common observation that a fainting person always falls forward, never sideways or backward. Immediately upon the relaxation of the back muscles gravity takes over and now we see just how unstable the skeleton is. Without any apparent pause the head drops forward, the knees and ankles buckle, the hips give way, and the body pitches forward.

At first thought such an arrangement seems extremely at variance with the degree of perfect adaptation that has been reached by the body in other respects. But a moment's reflection reveals that this behavior is in our best interest because it saves us enormous amounts of energy. Were it not for the effective use of gravity we would be forced to carry on many movements which under this system require nothing more than the inhibition of muscle tensions. Most of these movements would be devoted to overcoming inertia, the function most wasteful of energy. To utilize gravity for the purpose we have only to stop the impulses going to certain muscles and they relax.

We may take the act of walking as an excellent example. Beginning from an erect position we do not lift one or the other leg in front of us in the manner of the German "goose step." Instead we permit ourselves to start to fall forward and catch ourselves with one leg before we have fallen too far. As we increase our gait, or break into a run, we lean farther forward to permit gravity greater effectiveness.

Mention was made previously of the fact that the two sides of the body were balanced structurally, that is, the bones and muscles of the one side were equal and opposite to those of the other. In the anteroposterior direction a completely different arrangement is disclosed, and one would be likely to question whether the principle of equal and opposite tensions could hold. Certain of the muscles are heavy and some are delicate, and the skeletal parts to which they are attached show no resemblance to each other. More careful analysis, however, and particularly that conducted by means of experiment, reveals that the same condition of balanced tensions prevails and that this is made possible by a utilization of certain well-known mechanical laws.

Everyone knows that as the length of a lever is increased it gains in its effectiveness to do work without increased need of power. A father, playing with his child on a seesaw, places the child at the end of the plank and sits close to the fulcrum himself. Thus the weight of the child becomes equally effective to his own weight. In a similar manner, muscles attached close to a center of movement must be much heavier than those placed at a distance from the center. In short, a weak muscle can balance a strong muscle effectively if its lever arm is longer. In an identical manner, gravity is increasingly effective as the distance from the fulcrum increases. Before going to an application of these principles there is one more enigma to be explained. This relates to the movement of parts and the problem might be stated as follows:

If muscles are constantly working against each other and if a muscle tends to build up resistance when the effort is made to lengthen it, i.e., the stretch reflex, how is any movement possible except by extreme effort? In

other words, when one muscle is stimulated to contract (the protagonist) why does not its shortening lead to the stretch reflex in the antagonist? This question was answered by the famous English physiologist, Sherrington, who, by cutting off all possible chance for impulses either to leave or enter the brain, demonstrated that simultaneously with the stimulation to the protagonist there was an inhibiting impulse sent to the antagonist which permitted it to lengthen. Under the influence of this reflex arc, which goes through the spinal cord only, the muscle behaves contrary to the manner it displays when isolated. With these basic physiological principles in mind let us examine the area in which the orthodontist works.

At least four muscle functions influence the human denture, viz., posture maintenance, deglutition, mastication, and facial expression. None of these is independent. The muscles that serve them may be more or less strictly classified at rest but in activity it is seen that each group may enter into the work of another. Before considering anything else it would be wise to set the stage and this can be done quite adequately by taking up the problem of posture maintenance.

For the purpose of our discussion we may consider the shoulder girdle, clavicle, sternum, and scapula, as a fixed base of operation. Arising from the back is the cervical portion of the vertebral column, a structure already referred to as a column of spools, which is curved in a ventral direction. Surmounting this is the globelike head teetering on two half-round occipital condyles. In addition to the instability of this arrangement it has been shown that the center of gravity of the head lies in front of the condyles. Thus, there is a mechanical arrangement that would collapse anteriorly were it not for some force to hold it erect. This force is contributed by the great muscles of the back of the neck which attach to the occipital bone above and run down to insert on the cervical and thoracic vertebrae and to the shoulder girdle (Fig. 1).

But the posture of the head involves more than the tensions of these posterior neck muscles. Were gravity the only force to be opposed or resisted these muscles would not need to be as heavy as they are. The front of the head is concerned with a number of functions which require movements of certain of its parts and such movements demand muscles and the resulting tensions of such muscles. These tensions are added to the load imposed by gravity and both must be balanced by the postcervical group if the head is to be kept in an erect position. The major muscles contributing the tensions in the front are those of the masticatory, supra-, and infrahyoid groups. These might be thought of as links in a chain, joining the cranium with the mandible, the mandible with the hyoid bone, and the hyoid bone with the shoulder girdle. Thus in front as well as in back there is connection between the cranium and the body but in front there is the possibility of independent movement on the part of two bones, mandible and hyoid. A diagram will serve to make this clear (Fig. 2).

Let *A* represent the head minus the upper face, which plays no part, and *B*, the vertebral column. *C* represents the shoudler girdle to which the mus-

culature of the head and neck is attached below. *D* represents the mandible and *E* the hyoid bone. Connecting the various parts please imagine elastic bands under slight tensions. It should be clear that although the various parts, *A*, *B*, *C*, *D*, and *E*, could not possibly be maintained alone, they become a stable unit by the addition of the elastics. And the analogy can be carried a little farther. An increase in the tension of any single elastic would lead to an increase in all, but as soon as the tension was released the parts would return to their original positions. Substituting muscles for the elastics we can see that

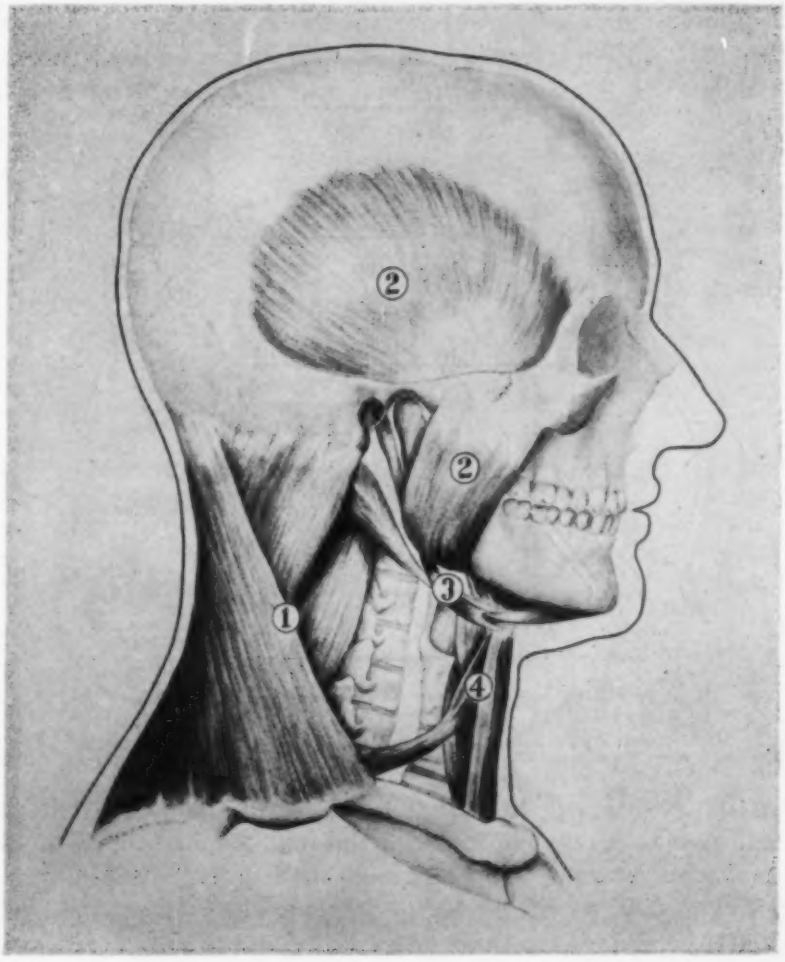

Fig. 1.—Muscles concerned with maintenance of head posture. *1*, Postcervical group; *2*, masticating group; *3*, suprahyoid group; *4*, infrahyoid group. (From manual of Telephone Extension Program, Current Advances in Dentistry, University of Illinois, 1949.)

in order for tension to lead to movement there would have to be inhibition of tension in the muscles that would otherwise give resistance. As an example, suppose it is desired to elevate *E*, the hyoid bone, which must be done in swallowing. Tension would have to be increased in the muscles connecting *E* with *D* (the mandible). This would of course be equally effective in lowering *D* which is not desired. Additional tension must be built up in the muscles connecting

D with *A* to prevent it, and tension must be *inhibited* in those connecting *E* with *C*. This means that when the act of deglutition is performed the muscles of mastication must contract to afford stability to the mandible so that the suprahyoids can raise the hyoid bone, and the infrahyoid muscles must relax so that no drag occurs. To test this for oneself it is only necessary to place the finger tips lightly on the temples and swallow. At the height of the act a pulse of contraction will be felt in the temporalis muscle. There are intermuscular reactions of this sort involved in every movement of any part, cranium, mandible, or hyoid bone, but the point to be remembered is that at the end of all such activity the parts return to a state characterized by balanced tensions—or rest. How does this affect the orthodontist in his work?

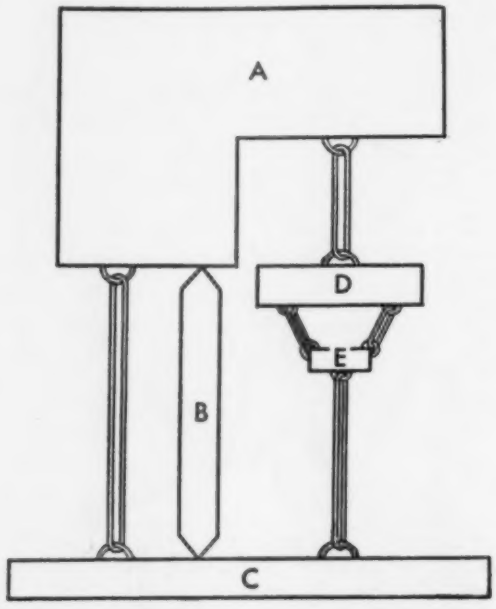

Fig. 2.—Diagrammatic representation of the equilibrium of the head skeleton. (From manual of Telephone Extension Program, Current Advances in Dentistry, University of Illinois, 1949.)

The resting position of the mandible, as so ably demonstrated by Thompson, finds the teeth out of occlusion with those of the maxilla. The separation may amount to an interval of 2 to 12 mm. but it is quite constant for the individual. The closing path followed by the mandible from this resting position may not be in the upward and forward direction thought of as normal. It can be deflected by teeth in malposition or by the form and inclination of the articular eminence. This makes questionable the common habit of viewing models in occlusion as most of us do. Our base line for starting a diagnosis should always be the resting position of the mandible and this, as has been pointed out, is a position determined by muscular equilibrium. As we have seen, this equilibrium is a function that is related to the maintenance of head posture. Turning now to the next group with which we deal we shall consider the act of deglutition. This is a function of the tongue, buccinator, and the pharyngeal and palatal musculature.

The function of swallowing is well developed at birth and for very obvious reasons. It is not surprising, therefore, to find the parts of the mechanism well advanced in size and relationships (Fig. 3). The tongue, probably next to the brain in percentage of total size attained, completely fills the oral cavity, flaring out to contact the lips and cheeks in many instances. It should be recalled that the alveolar processes are nonexistent at this stage and that the jaws are widely separated from each other. The tongue, attached by muscles to the symphysis of the mandible below in front and to the cranium and hyoid in back, can be thrust forward and backward within the confines of the buccinator like a plunger in a tube and thus act as a sucking organ. We shall return to this relationship of tongue and buccinator in a moment, but now let us turn to the tube which must handle the food as it is propelled backward from the mouth.

Fig. 3.—Tracing of lateral cephalometric roentgenogram of newborn. Note that although the jaws are apart the lips are closed and the tongue supports them from within.

The upper end of the pharynx is relatively inactive because of its bony attachments (Fig. 4). In front it is attached from above downward to the lower third of the medial pterygoid plates, which also form the most posterior limits of the nasal cavities, and to the pterygomandibular raphe, a fibrous strand which runs between the lower tip of the pterygoid lamina and the *medial* aspect of the mandible near the junction of the ramus and the body. Thus the width of the anterior aspect or orifice of the pharynx is determined by fixed bony attachments. The right and left superior constrictors converge as they run posteriorly and join in back at the midline, being attached to the

pharyngeal tubercle of the occipital bone above and to the prevertebral fascia behind. The inertness of the upper end of the pharynx is compensated for by the lively activity of the soft palate and particularly by those muscles which form the pillars of the fauces. These appear to be the upper members of a peristaltic chain which extends from here to the stomach. There seems no need to give further consideration to the pharynx since the lower parts appear to play no role so far as the teeth are concerned. Let us return to the buccinator and tongue.

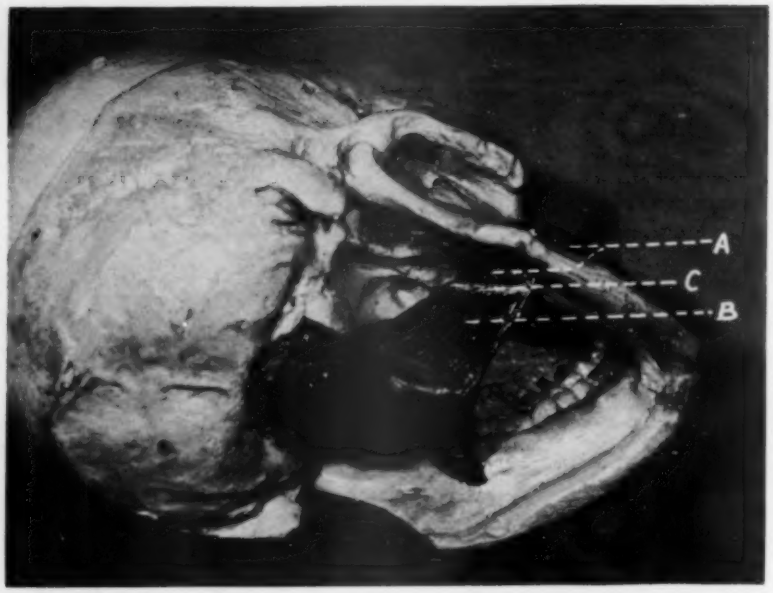

Fig. 4.—Posteroinferior view of superior constrictor of the pharynx *(B)* showing its attachment to medial pterygoid lamina and to pterygomandibular raphe *(C)*. Note that buccinator *(A)* attaches to same raphe and crosses from lingual to buccal in back of dental arches. (Model by Dr. A. Goldstein.)

It must be remembered that the posterior attachment of the buccinator muscle is the same pterygomandibular raphe which affords anterior attachment to the superior constrictor of the pharynx (Fig. 4). This results in a continuous band of muscle which runs forward from the basilar part of the occipital bone, just ahead of foramen magnum, to enclose the tongue in the infant. But the course of this muscle sheathing is changed by the bony attachments of the buccinator. The pterygomandibular raphe lies medial to the alveolar arch and the mandibular and maxillary origins of this muscle are on the buccal or lateral aspects of those bones in the molar region. Thus the buccinator must cross from lingual to buccal in the back of the mouth. This is important in the formation of the dental arch.

It was mentioned earlier that at birth the tongue completely filled the mouth and was in contact with the inner surface of the cheeks and lips, or, in other words, with the buccinator; also, that the alveolar processes were virtually nonexistent. These processes grow quite rapidly, however, and ul-

timately the teeth began to appear through their crests. Thus it can be seen that the direction of alveolar growth and the eruption of the teeth would be strongly influenced by the tensions of the two muscle groups, tongue within and buccinator without, which the growth of the process and eruption of the teeth separate for the first time. These muscles are the first orthodontic forces to operate on the teeth and they continue to influence them profoundly throughout life.

If it is recalled that voluntary muscle is always under a degree of tension, the results of the relation between tongue and buccinator can easily be grasped. The tongue is a mass, the position of which is determined by its suspensory muscles in the same manner as that shown to operate on the mandible, hyoid, or any other moving part (Fig. 5). This position is assumed at a very early age, probably well before birth, and the alveolar processes and teeth must conform to the periphery of the organ. The buccinator, stretched around the outside, contributes inward pressures and an equilibrium results. The position assumed by the teeth represents the point at which equilibrium is established.

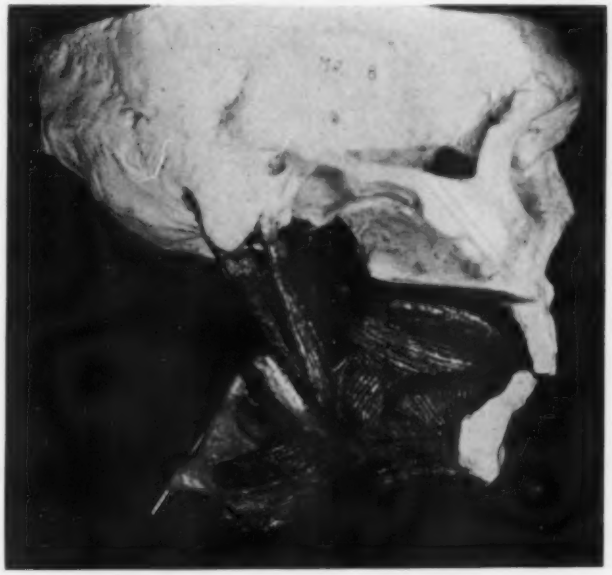

Fig. 5.—Reconstruction of tongue and its suspensory musculature. (Model by Dr. A. Goldstein.)

But equilibrium does not imply normality. If the tongue is relatively too large at birth and during infancy as it not infrequently is, the equilibrium established will result in spacing of the teeth. Spaces due to this cause tend to disappear as age advances because the rate of growth of the tongue diminishes more rapidly than that of the facial skeleton.

The position of the tongue likewise influences its effects upon the teeth and alveolar processes. Its normal position finds it almost completely occupying the mouth cavity, including the vault, but occasionally it is positioned no farther superiorly than the occlusal level of the lower arch. In most cases

this will be found to be due to variations in those bones of the face from which the tongue is suspended. Thus, in Class III types with the extended mandible and with the hyoid bone at a relatively lower level, the tongue is literally dragged to a lower position. This has the effect not only of overexpanding the lower but of robbing the upper arch of the tongue support it normally enjoys.

The buccinator is more likely to show its influence on the upper arch than on the lower, and in the case of this muscle the position or degree of development of the bones to which it is attached is of greater importance than is any state or function of the muscle itself. For instance, a lack of lateral development of the maxilla, either bilaterally or unilaterally, results in buccinator origins that are not in correct relation to those of the mandible. The muscle is therefore forced to take a downward and lateral course, and in so doing it creates lingual pressure on the upper buccal teeth, particularly the molars. Such cases will present constriction of the upper arch, either unilateral or bilateral, depending on whether one or both maxillae are involved.

The posterior ends of the dental arch are another locality where the influence of the buccinator and superior constrictor can be seen. As has been mentioned, this muscle leaves the buccal surfaces of the maxilla and mandible and crosses to the lingual surface as it travels posteriorly. Free of bony attachment over this interval it tends to straighten and thus creates an inward force on the last tooth. This accounts for the fact that the alveolar process does not lie over the body of the mandible in the molar region but increasingly toward the lingual side, until in the third molar region it seems to be literally a projection from the lingual plate.

Turning now to the mimetic musculature we enter upon consideration of the final group which concerns us as orthodontists. This group has received most attention because it is so noticeable and because it seems to be the most susceptible to habit formation, the results of which can be seen. Again we must turn to the buccinator because that muscle forms the basic foundation of the lips.

The buccinator loses its bony attachments at the prominence which overlies the first permanent molar and runs free from here forward and medialward to join with its fellow of the opposite side. Completely encircling the teeth it exercises a gentle inward pressure, principally on the upper, tending to mold them into a semicircle. The most superior and inferior fibers of this muscle continue around through their respective lips but those at the level of the lip line decussate, the lower traveling to the upper and the upper traveling to the lower lip. This arrangement is necessary to keep the lips closed because the tooth arch is greater in size than that of the bone that supports it, and the tonicity of the muscle would otherwise cause the lips to part. The lip line may vary from the level of the incisal edges of the upper teeth to well above their gingival margins, and it thus becomes apparent that it is the lower lip that controls the upper teeth.

The buccinator constitutes the deepest layer of the lips, and as we have seen it is the mechanism primarily concerned with sucking and swallowing. The true muscles of expression are superficial to this layer and may be looked upon as merely modifiers of the mouth opening. They are among our most recent evolutionary acquisitions and are subject to wide degrees of variation and stability. Reference to Fig. 6 will permit the reader to follow a description of their functions.

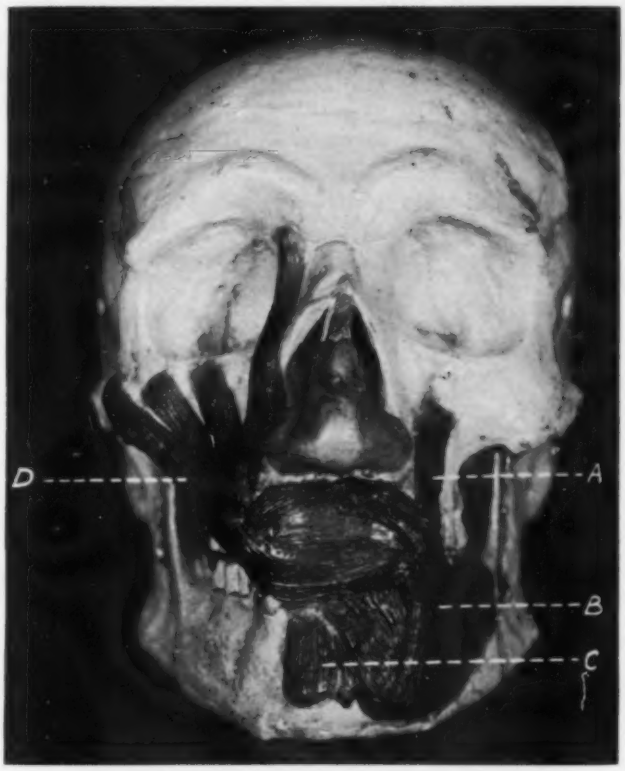

Fig. 6.—Reconstruction of mimetic muscles. *A*, Caninus; *B*, triangularis; *C*, mentalis; *D*, zygomaticus. (Model by Dr. A. Goldstein.)

The layer just superficial to the buccinator is composed of two relatively strong muscles. The first of these is the caninus (Fig. 6, *A*), arising from the canine fossa beneath the orbit and running down and around the corner of the mouth into the lower lip as far as the midline. The other is the triangularis (Fig. 6, *B*), which arises from a rather wide origin on the external oblique line of the mandible and runs upward, its fibers converging to enter the upper lip and travel to the midline. At rest the decussating area of these two muscles is held slightly lateralward by the tensions of muscles superficial to them, but upon contraction they straighten to carry the corner of the lips medialward and cause a puckering. They are probbaly the most powerful of the lip muscles and their point of greatest activity is focused on the labial surface of the maxillary canine.

The superficial layer of the lip is made up of a number of relatively weak strands of muscles all of which end close to the outer surface and hence tend to curl the lips in an outward direction. Chief among these are two of the three heads of the levator of the upper lip and the depressor of the lower lip. In addition to these there are a few slips running to the corner of the mouth which deserve special attention albeit they are not very powerful. Chief among these are the zygomatic head of the levator and the zygomaticus (Fig. 6, *D*). Both of these run to the lips from wide origins; in fact, they are the only muscles that arise from bases that are more widely separated than the width of the dental arch. Thus they tend to break the even tensions that would otherwise operate to form a semicircular arch by relieving the corner of

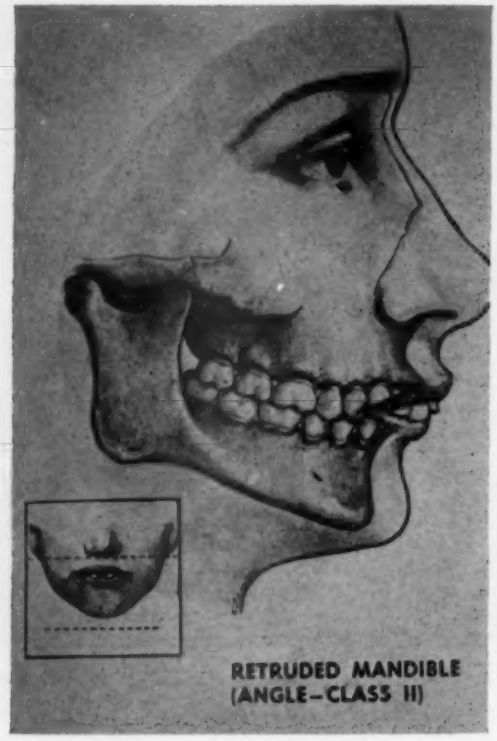

Fig. 7.—Representation of relationship of lip musculature at rest in Class II, Division 1 malocclusion. (From manual of Telephone Extension Program, Current Advances in Dentistry, University of Illinois, 1949.)

the mouth and permitting the canine to assume a prominence greater than that of its neighbors. This same tension flattens the incisal segment. All of these individual tensions plus the tongue within the arch are in a state of equilibrium at rest; but this rest must be thought of as an equilibrium of forces. This implies that if any single force is either increased or decreased the entire structure is unbalanced until, by movement of teeth and molding of alveolar process, a new position of equilibrium is reached. This thought will serve as an introduction to a consideration of certain common conditions met with by the orthodontic practitioner. A start can be made with the Class II, mouth-breather type (Fig. 7).

It should be pointed out that in this condition the skeletal structures are the primary agents responsible for the muscular dysfunction. The lower arch and jaw is posterior to its normal relation to the upper, and hence the upper arch, upon which the muscles exercise their most profound effect, is robbed of the support of the lower teeth from the premolar area on one side to that of the other. The lips are deranged for the same reason. The upper, being controlled principally by muscles running to it from a retruded lower, is under increased tension and this tension is most effective at the corners of the mouth, pressing the canines palatally and leading to the tapered arch and protruding incisors so typical of this malocclusion. The lower lip, controlled by muscles running to it from the upper jaw, is no longer able in most cases to exercise its restraint on the upper incisors. It parts company with the upper lip, which tends to curl up, and retreats to a position of less tension which is usually beneath or behind the upper incisors. If the latter, the protrusion of those teeth is accentuated. The lower arch in these cases does not seem to suffer so far as its form is concerned. Molded around the tongue by the even pressures of the buccinator, it tends to become semicircular but is otherwise normal in form.

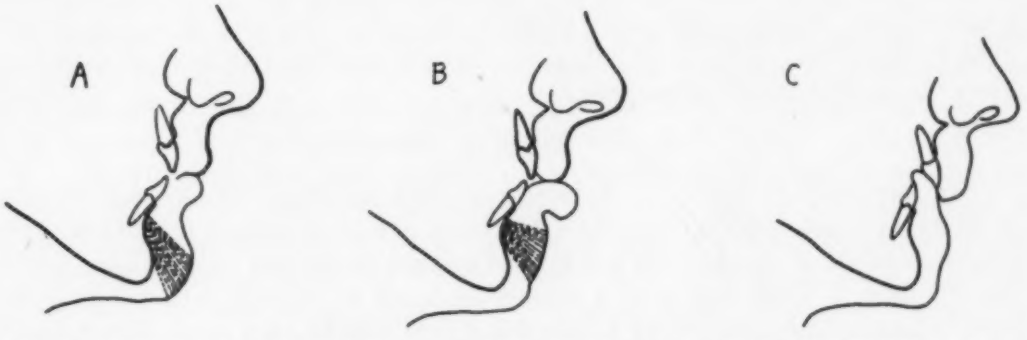

Fig. 8.—Diagrammatic representation of mentalis muscle. *A*, At rest; *B*, contracted as in a whimper; *C*, combined with lip-sucking.

I have left for last a muscle that is not, strictly speaking, of the lip group but one whose activity may profoundly affect the position of the lips as well as their action resultants. This is the mentalis (Figs. 6, *C* and 8, *A*). This muscle arises from the incisal fossa of the mandible and runs downward, i.e., away from the lips, to be inserted in the integument of the chin area. In some it is weak and relatively underdeveloped but in others it is strong and bulky. It can be very damaging in its action. When it contracts it elevates the soft tissue overlying the bony chin and by so doing pushes the lower lip up. If the upper lip is tensed simultaneously the lower has no place to go and is deflected in an outward direction as seen in a whimpering child (Fig. 8, *B*). When such an elevation of the chin is indulged in as a habit it can cause a number of different deformities, depending on the conditions presented by the dentition. The level of the lip line and the relationship of the jaws frequently modify its results.

If the lip line is high, a hard mass of tissue, which the contracted mentalis constitutes, is localized over the upper incisors. Any orthodontist knows that

this would cause a retrusion of these teeth and, if the jaw relationship were normal, that such retrusion would lead in turn to a break in the corresponding area of the lower arch. If the lower jaw were in a Class II relation the retrusion of the upper incisors, meeting no opposition from the lower arch, would be more severe. This would simulate the Class II, Division 2 type of upper incisal arrangement.

If the mentalis habit is superimposed on a Class II, Division 1 pattern, i.e., one in which the lower lip has no control over the upper incisors, its full force is felt on the lower anterior teeth (Fig. 8, *C*). In such a case it is these teeth that tip lingually, ducking behind the canines and assuming a marked lingual inclination. This condition is frequently aggravated when the patient develops a fancy for the taste of the lower lip and begins to suck on it. Finally there are those cases in which the muscle mass is brought to bear on the lower incisal gingival tissue. In such cases the occlusion may not be disturbed but the labial plate will be attenuated and the gingival tissue will be in a constant state of inflammation.

The abnormal or rather the excessive functioning of this muscle might be compared to the knot one ties in a handkerchief for the purpose of making a tourniquet. It brings excessive pressure to bear at one spot in an otherwise even constriction. The effect it has on any one particular individual depends upon the level at which it operates.

SUMMARY

In summary it should be pointed out that although the skeletal framework from which muscles operate determines to a large extent the course and direction of these organs, it is not safe to assume that it can be dismissed from our thinking. There has been a strong tendency to restrict orthodontic considerations to the morphology of the bony face and to view such morphology as static. It can never be forgotten that the close relationships between bones and muscles have been developed by adaptation and that the chief characteristic of that relationship is an equilibrium that serves to conserve energy.

The teeth and alveolar processes should be looked upon as passive though responsive victims of a continuous interplay of muscular forces, their positions dictated by the resultants of these forces. No wishful thinking about straight profiles or upright incisors, nor the most clever appliance manipulation, will serve to hold teeth in positions that are contrary to the dictates of their muscular environment. It is to be hoped that the future will find us more aware of the significance of these matters.

808 S. Wood St.

A RESTATEMENT OF THE MYOFUNCTIONAL CONCEPT IN ORTHODONTICS

ALFRED P. ROGERS, D.D.S., A.M., D.Sc., BOSTON, MASS.

MY ORIGINAL decision to devote my thinking to the value of nutrition and muscular function as it applies to orthodontics has never ceased to fill me with enthusiasm because the laws of human reasoning with which I started many years ago seemed to coincide with the natural laws governing growth and development. The fact that we are able to gain insight into the mechanisms of nature through observation and research makes the quest of these laws appear to me as one of the most important scientific pursuits of life. In my endeavor to clarify my thesis I have tried to express this hypothesis in a manner that I considered to be simple and easy of comprehension; but thus far I fear that I have failed to make a very deep and lasting impression upon many of our profession. It is because of this that I appear once more before you to make one more endeavor to stress the value of myofunctional treatment, not alone because of the satisfaction its intelligent application can bring to the orthodontist, but to the many benefits it can bring to the growing child.

In undertaking a re-evaluation of myofunctional therapy in orthodontic practice, it might be of advantage to attempt a brief general review of some of the nonmechanical requirements in a comprehensive understanding of the practice of orthodontics. Of course, it should be understood that a task such as this can be dwelt with but briefly in one short paper. For some it needs but a suggestion to start the mind toward creative and constructive thinking. It is from such minds that I hope to evoke on this occasion a response to a deeper consideration of all things basic in relation to child growth and development, as it touches oral and facial maturation.

At the outset let me say that I think there is a great deal more to orthodontics than mechanics, as valuable as they have proved to be. However, I deplore the facility of the drift, which is apparent after graduation, to the mere mechanical phase of practice, sometimes almost to the total exclusion of the basic. The truth often lies not hidden but finally available to the one who is persistent in his research. The practitioner who depends upon research is always in an important position, for he must continually weigh the merits of the material placed before him by research men and other writers. He it is who must be equipped to judge, and the wisdom of his decisions depends upon the employment of his basic knowledge and his ability to think by the scientific method, instead of building up arbitrary justification for unscientific practices. Such scientific method gives the surest guarantee that as a profession we shall become more and more essential to the well-being of mankind.

This paper was read before the American Association of Orthodontists, Chicago, Ill., May 10, 1950.

The philosophical attitude of mind is also a major requirement and must not be thought of as antagonistic to the scientific. Indeed, philosophy and science are in such accord as to be essentially interdependent, for philosophy is the love of truth and science the search for truth.

The nature and scope of the problems that confront the orthodontist in his attempts at the correction of dentofacial anomalies are far-reaching, and implicit upon the appreciation and understanding of the many biotic and psychic phases of human growth and development. Especially is this true when considering treatment based upon the theory and practice of myofunctional therapy. Neuromuscular activity is one of the inherent qualities of growth and development, and the maintenance of the health of the organism as a whole. For our purpose I cannot overemphasize the fact that the bony structure of the jaws with its muscular attachments, its tendons and its ligaments, forms a functional unit which, if malfunction is found in any group sufficient to bring about changes in its use, is almost certain, if long continued, to be followed by maldevelopment. It is not difficult then to understand why certain persistent muscular habits may have an important influence, not only as a cause of dental anomalies, but also on the final results of orthodontic treatment. The scope of our efforts includes every phase of the growth and development of the child, and every phase of its environmental influences.

Although too little is known in respect to the varied influences of heredity, we must as a basic consideration make use of what little knowledge we possess when attempting to evaluate hereditary influences as underlying factors in the causation of the various forms of dentofacial anomalies which are presented to us daily for our study and treatment. We know that children tend to resemble their parents, that the inherencies do not all come directly from the immediate parent, but are influenced by the traits of the long line of ancestors. Even so it is a valuable and ofttimes helpful experience when both parents are available for observation. Growth patterns may be such that to attempt to alter them would not be in the best interest of the child. Family likenesses should be allowed to remain when an ideal occlusion at the same time is attainable. For example, the extraction of one or more teeth may alter the facial contour ever so little, but that little in some instances may alter the family pattern and prove a disappointment to both orthodontist and parent. Therefore the type must be given careful consideration and evaluation.

The mind well established in relation to basic truth considers the infinite individuality of the human facial form, for there are variations of all sorts, significant and insignificant in the form and features, in the size and shape of the dental arches, and the bones that support them, in the muscles and nerves that control their function; there are hundreds of peculiarities of face and body form. These things the orthodontist needs to be conscious of whenever he sets himself to use his knowledge and judgement in behalf of any individual. He must be ever conscious of the fact that since every individual child varies in many ways in physical and mental life, no rule is a safe rule other than the fundamental one of full and complete development consistent with the inherited endowment of the individual. That is why genetics with its laws of inheritance

should enlist the serious attention of every student. "What kind of material has each child started life with?" The answer to that question makes a very real difference with the attainment of the wished for goal in every treatment that is undertaken.

Hence, one interested in myofunctional therapy as an aid to general treatment should become sensitive to these wide varieties of facial characteristics and render them the respect they deserve when, if at the same time, as I have already suggested, an ideal occlusal relationship is obtainable for the individual. Slight functional peculiarities may be of an inherited nature or they may sometimes be imitative. To determine this, close observation of both parents is necessary. Such slight functional peculiarities are sometimes important factors in establishing certain types of dentofacial anomalies, and it often takes careful observation, tact, and patience to assist the patient in overcoming them. Then, too, we are sometimes confronted with mental peculiarities which may interfere with the smooth progress of treatment. These peculiarities are very often inherited from one or both parents, and when they are they are difficult to deal with—for example, the negative-minded child. For him the approach to cooperation will be found quite different from that of the cooperative individual. These observations have special significance when undertaking myofunctional treatment. A failure to evaluate them may very well become the stumbling block which interferes with success.

Proper nutrition is another important factor in the growth and development of the organism. The orthodontist is bound not only to make careful observation, but also to assume an active interest in the nutritional background of any child that comes under his supervision, for the very good reason that no mechanically conceived method of treatment can be satisfactorily employed where the effects of malnutrition are prevalent, and no system of myofunctional therapy can be fully effective if the blood stream is not supplying the tissues with the proper nutriment upon which to grow and develop.

Sherman in his *Food and Health* said:

> In applying the newer knowledge of nutrition to the practical problems of the feeding of children we should always give the child the benefit of any scientific doubt; and this may demand, among other things, the investment of much time and thought in the patient and persistent education of the child into good food habits. Where differences of interpretation or emphasis appear in the scientific literature of the subject, as, for instance, in the greater emphasis upon milk by some writers and upon fruit juices by others, it is well to give the child the benefit of the doubt by feeding liberal allowances of both milk and fruit juice, even though it takes time and trouble to establish the habit of the consumption of the desired liberal amount of milk.

Also within our field we find of paramount importance the psychological aspect of not only the child itself but that of its immediate environment. All too often the efforts of the orthodontist are thwarted by mental maladjustments which, if they are recognized early enough, can in most instances be eradicated, preventing their serious interference with the child's happiness and cooperation,

as well as with the understanding and mental comfort of the parents. I think this subject is one of vast importance, for the proper understanding and management can spell success, whereas, on the other hand, the neglect of early recognition and a tardiness in applying corrective measures may well bring about discouragement and failure. This is true in all phases of orthodontic treatment, but it is particularly conducive to failure when it becomes a problem in the application of myofunctional treatment.

The orthodontist who attempts the use of myofunctional therapy as an adjunct to his mechanical treatment will be greatly handicapped unless he is sensitive to the nuances in the mental make-up of many children. His success depends very largely upon his ability as an understanding teacher in leading the child into an appreciation of the values to be derived from the proper and faithful performance of the necessary instructions. No orthodontist can accept that modern brand of child psychology that encourages the lack of discipline in the interest of self-expression. Discipline is basic in any treatment looking toward the physical education of the child. When he is disobedient to instruction the orthodontist's task is often hopeless. I have many times expressed the belief that the orthodontist must consider himself a teacher, an instructor if you will, in physical education where obedience is essential. He who takes this attitude seriously is the one who holds his professional work in greatest esteem, giving more proficient service, and in return reaping greater satisfactions. His is truly a profession and not merely a mechanical trade.

Now the next facet that should engage the attention of the orthodontist in his initial contact with his patient is that of posture. Posture often is dependent upon two of the foregoing: nutrition and psychological reactions. Now postural defects are not to be considered as localized in the organism. The organism is an entity and should be studied as such when viewing certain forms of dental anomalies, notably those characterized by distoversion. Here we have a good example of faulty posture, and it is extremely important that the orthodontist recognize it as such, and that it has a definite relationship with the posture of the entire body. Someone has said that physical training is the key to beauty of form and face as well as grace of motion. "The fact cannot be overemphasized that the skeleton with its muscles, tendons and ligaments forms a functional unit, alteration to any part of which may, by bringing about changes in the use of the part affect regions far beyond that directly concerned in the alterations, and perhaps even through the entire skeletal apparatus."[2]

We must then realize that the intensity of functional activity, and the physiomechanical forces by which it is accompanied play a great part in the life of the organism. We, therefore, in focusing our attention on the child, naturally include in our plans the correction of all postural defects. It very often happens that the orthodontist must seek the services of the orthopedist whose instructions should lead, in the final phases of treatment, directly toward a complete structural rehabilitation represented in the child whose head is erect and whose muscular system coordinates as it should in a completely vital organism. The orthodontist is fundamentally concerned with both the bony

and the soft tissues of the organism, and from his contact with the various types of malformation it must appear to him that alteration or modification in the form of structure of the bones must be of paramount interest.

Many of these modifications are found to occur in direct response due to factors of an extrinsic origin, such as we have seen are associated with functional activity. The concept of myofunctional treatment is based upon this assumption, and while we, as orthodontists, have not been able as yet to perform many laboratory experiments to prove or disprove the theory, we find in our associations with animal biologists and osteologists that the theory and practice have, from a laboratory standpoint, at least, many observations for their support. We are growing accustomed to the thought that whenever there are growing structures there must be adaptive modification, and that these modifications can be demonstrated independently of laboratory experimentation.

In former papers I have called attention to many of these, and while it may not be entirely necessary at the present time to reiterate them, it might be interesting to direct attention to the fact that architectural development as the child progresses from infancy to adulthood is principally due to the factor of functional activity. We also can recall instances of atrophy due to inactivity after loss of function from one cause or another. Thus we can readily understand that function and mechanical factors play an increasingly active part in the later stages of normal development.

Our students of myofunctional therapy in the future might find a field of profitable investigation in intensive studies of bone architecture and its correlation with functional requirements, together with investigations of the mechanisms which underlie various adaptations. Then, too, the study of normal processes of growth and development are problems for the future, but problems that if solved by the intensive study of architectural forms of the facial bones might throw a flood of light on many of our obscurities.

Work of this nature that is being carried on by some of the members of our society gives hope for greater basic understanding later, for we must always be alive to the fact that creative vision will always be seen through eyes that are focused on the future. "It is well to notice that in the skeleton of the adult, structural modifications show a close relationship to the mechanical stresses, bringing about changes of a mechanical suitable nature. At all levels of development there can be shown relationship between structure and function which the animal biologist expresses as suitability or harmonious relationship."[2] But, of course, we recognize that functional activity is not responsible for some structural changes. In other words, it is only *one* of the factors, but a very important one. What the orthodontist needs to remember is that form and structure of bone are originally dependent for their form on that of self-differentiating cartilage model, but at the end of the embryonic period the influence of the stresses due to functional activity modifies both its form and structure. For example, at first most of the structures of the brain are present as undeveloped form and by use and exercise they develop into the mature

brain; other illustrations: The horseman after years of riding will show a modification in structure in his bowlegs; the cobbler, after years at the bench, will also give evidence of structural changes due to muscular strains and stresses.

The modification induced in form of bone by factors of a functional nature has mostly been discovered by experiments.* In the case of the human organism these factors have been noticeable following certain surgical operations, especially where the processes of growth are still going on. This is especially true when it is required to produce a structure like a joint. Even articular surfaces have been brought into existence. Too, it has been discovered, and now is universally admitted, that functional factors can influence the thickness of the bone.

An eminent physiologist, A. V. Hill, in *Living Machinery* said: "There is for each structure an ideal form, but this ideal form can suffer modification from stresses of a functional nature whether these stresses be in a normal direction or an abnormal direction."[3] We recognize the truth of the latter when we observe minor deformities resulting from pressure habits of various kinds. May it not be accepted then as true that both ultimate form and structure of bone may depend upon its normal function? Furthermore, we know that atrophy ensues following long periods of disuse. Now what is true of fluid bone may equally be true of muscular tissues. Atrophy we know follows disuse, and the full development of muscular tissues follows full functional activity, providing nutrition is adequate.

Now in the past I have frequently referred to the muscular system of the jaws, face, and neck as "living orthodontic appliances." "Indeed, they are biotic engines with similarity and differences when compared with man-made engines. Unlike mechanical creations they are self-repairing, but like man-made engines they consume fuel and produce power. Physiologically they depend upon nerve stimulation to their fibrous material. They are biochemically stimulated, and in this way resemble internal combustion engines. Altogether these wonderful machines of the living body can in many respects be considered superior to man-made machines, because they are under the control of the will and can be consciously stimulated to increased effort and efficiency."[3] The efficiency of these living orthodontic appliances is important to us especially when we conceive of the amount of work they are able to accomplish.

When properly directed and controlled, they tend always in the direction of normal development, and one of the most interesting and important features is that the more they function within limits, the stronger, more beautiful, and more balanced they become. Now balance is a word that means much to the orthodontist. It implies the final attainment of the normal, the harmonious, and the beautiful. Can anyone conceive of any more gratifying termination in orthodontic treatment than essential groups of muscles developed to their utmost in perfect balance, able to sustain and maintain an ideal occlusion?

For the final word in respect to these internal self-contained engines, let us think of their complex and their ever-present effort and growth filled with

*See monograph by Baker, Lawrence W.: The Influence of the Formative Dental Organs on the Growth of the Bones of the Face, AM. J. ORTHODONTICS AND ORAL SURG. 27: 489, 1941.

function and adaptability, possessing biochemical processes, commanded by intelligence and purpose, a mechanism which is wonderful, beautiful, and efficient for its created purpose.

Having considered the physiological factors so important to our success, let us return to a consideration of the practical application both psychologically and physiologically. There are many facets in the practice of myofunctional therapy that no doubt will present themselves to you as years of experience recall them one by one. There is one, however, that in my experience has proved not only of great interest, but also of immense satisfaction. It is a psychological facet, one which can give satisfaction beyond calculation, because it allows the orthodontist to become something to the child other than a mere straightener of teeth. A child during his growing years, when he is struggling to understand, very often becomes confused and uncertain.

There is one psychological approach which may be far-reaching in its ruinous effects, but which, on the other hand, may be the spark that raises hopes, engenders confidence, and dispels frustrations. It is found in the ability of the orthodontist to lead the child into self-reliance, self-efficiency, and confidence by the simple process of teaching him that by the effort of his own will he is able to improve his physical structure by assuming command of a few groups of muscular tissue. If once you teach a child that lesson of self-development, be it ever so slight, you have created in that child a force that, if it grows, can lead on to unimagined success. I could not speak thus had I not had this repeated experience, and I would wish no greater satisfaction to any one of you than its attainment.

Not all of our efforts in treatment-aids through myofunctional therapy are crowned with success, because our efforts must ofttimes be of an experimental nature. Some children are uncooperative and at first definitely not interested; but such failures are but steppingstones to final success. The age of cooperation comes with the age of understanding, and at times one needs great patience in waiting for that favorable period in the mental development of the child. It is useless to harass him at any time. If in a given case after a few trials the young child does not respond, the postponement of all efforts is ofttimes the wisest course. In later years, when interest and the cooperative spirit have become manifest, progress may be ever so much more rapid and gratifying.

You will, therefore, readily understand that, if the exercises which I shall shortly illustrate for you are to be successful, the individual under treatment must have a real desire and determination to improve his physical condition. The exercises themselves must be carefully prescribed and supervised. If the child is unconvinced of his need he surely will not put forth the effort required to correct the habits of malfunction which have, in all probability, become entrenched after years of maladjustments. Progress at first should be rather slow and with some individuals where there is eagerness to improve quickly, attempts at excessive practice, at first, must be curbed, since the work is especially designed to develop weak muscles and create normal function and balance. Local muscular fatigue should be avoided because it might tend to injure the muscles rather than improve their condition. Therefore, the series

must be broken up into frequent and stated periods during the day so that the child will not be tempted to practice them during school hours or at other incongruous times. "It is inadvisable that muscular contractions be held for long periods of time because prolonged and undue pressure within the muscle may cause the blood to become dammed up within the muscle fibers, thereby preventing the prompt removal of waste products and renewal of oxygen and nutriment necessary for best development."[4] So extreme and continuous muscular contraction must be avoided; instead, follow each contraction with complete relaxation of the muscular group for a sufficient period to allow the normal biochemical processes to take place within the muscle. It should also be borne in mind that coordination and balance are as important factors as tonicity itself.

The orthodontist applying corrective exercises for the improvement of oral function must develop techniques entirely his own if his teaching is to be truly effective; and he will finally attain his ends by employing exercises which I have perhaps not even suggested; but it must be kept in mind that all the exercises must follow the path of normal function, and should, whenever possible, be carried out with the movable parts in the correct position of mechanical advantage to attain the greatest success. The orthodontist must be observant and critical of his own methods, and intelligently open-minded in facing new suggestions.

I think perhaps one of the best ways to stimulate interest in myofunctional therapy is to encourage men to make experiments upon themselves to learn what goes on in their own physical economies and thus, if they are so inclined, to engage in fundamental thought and learn from their own experience the truths which they can ultimately pass on to their patients.

In turning aside, as we are on this occasion, from the consideration of mechanical aids in orthodontic treatment to stressing the physiological methods, it must be understood that in no sense do I disparage scientific use of simple mechanical apparatus. It is, of course, as indispensable to the orthodontist's practice as a mechanical apparatus employed by the orthopedic surgeon, but I stress the physiological because of its seeming neglect by the profession. Just here, if you will bear with me, is an example of what I mean. I should like to relate an experience of mine some years ago. Perhaps by retelling it, it may help to clear the atmosphere for more fundamental thinking.

> A number of years ago there appeared before an orthodontic gathering two essayists. One read an excellent paper on a new and improved mechanical device for the correction of malocclusion. The essayist had much to show for his mechanical effort, and the audience was duly impressed with the ease and speed of the results obtained. It was altogether a fine exhibition of what could be expected by the employment of these particular methods. The other essayist, a famous anatomist, gave an excellent and well-illustrated lecture on the physiologic anatomy of the face and neck, stressing the dental apparatus and the muscles of mastication. Later each of these essayists occupied space in the clinic section. The essayist who devoted his time to the mechanical consideration had numerous models for clinical teaching. The

> anatomist had spread before him many carefully prepared anatomical specimens. I entered the clinic room a short time after the clinics had started and noticed a great unevenness in the distribution of the members of the Society. Clustered about the table where mechanical orthodontics was being taught the interested listeners stood two or three deep, completely surrounding the clinician. At the table directly across the room sat the famous anatomist with his wonderful specimens, with not a single listener—not an individual with interest enough to inquire into the fundamental basic needs of the profession. This picture remained in my memory as a rather sad commentary on the basic interest which our profession as a whole actually takes.

What I wish to emphasize now is the fact that the proper understanding of the biochemical and biomechanical nature of our work is of greatest importance because only by pursuing such basic inquiry can we hope ultimately to solve our greatest problems. At this moment my mind goes back to the last annual meeting in New York where I heard a particular phrase repeated many times. The phrase was, "The tide has turned"! I heard it during the reading of several papers. I heard it along the corridors, and with it there seemed to go a certain vocal quality that suggested satisfaction, that implied a promise of relief perhaps from the further flood of ill-considered practices that have in recent years flowed through the channels of men's minds, leaking out to spread far and wide throughout the parent profession of dentistry until the children of our times have been subjected to a practice that is both unscientific and destructive, because it is based upon certain pseudoscientific physiological concepts that have support and encouragement from unexpected sources. This unscientific practice seeks to ignore the natural laws of growth and development that operate in response to heredity, nutrition, and function. It robs the child of the possibility of ever enjoying full oral development and dooms him to an inefficient oral apparatus by the acts of those who have forgotten or never fully realized that a child is a growing organism, forgetting that by limiting the volume of the oral cavity he is interfering with the balanced activity of important soft tissues involved in facial and oral function, and that he is failing to give the child an oral development suitable for the fully grown and developed adult that he is eventually to become. There is an element of tragedy that lies in the too frequent utilization of this method of practice that I could easily reveal to you were I to relate some of the things I have seen.

While I do not question the integrity of the motives of any orthodontist, I do sometimes question his wisdom. I do question the extent of his adherence to basic truths and I do fear him to be too readily willing to proceed under the influence of propaganda and example, rather than by understanding, by persuasion, rather than by fundamental thought. In striving to be a perfectionist in a mechanical sense he really becomes a destructionist doing homage to a false philosophy, a philosophy that does not coincide with the known facts of animal growth and development. He predestines our profession to accept a narrowing field of influence where its intellectual growth and its general usefulness are bound to suffer. It can never become the broad field for research

leading to advanced achievement; and we must not forget that true orthodontics is too essential to the well-being of mankind to become a cult and fad-tainted profession.

Let us ask who among us has the right to say that he denies the creative wisdom of the ages, the creative wisdom that rests upon natural laws that are unchangeable and eternal. The healing powers of nature rest upon balance and the restoration of balance, and whenever and wherever mankind has interfered with that balance he has paid the penalty.

There are too many among us who follow their own devices, instead of obeying the laws that they have been taught but fail to practice. It is time that we seriously seek a better understanding of these fundamental laws that underlie growth and development and thereby enlarge the scientific rational basis of the profession, that we may impart to those who come to us for guidance and help the kind of service they require and need; and let me emphasize that the field of orthodontics is far broader than some would lead us to believe. It is as emphatic in its demands upon us as any science that deals with the processes of life in its understanding of the varied biochemical reactions that sustain the living organism. We should expect still further reorganization of our educational system so that future students may learn more definitely to orient their knowledge and eliminate that gap which now exists between basic teaching and practice. The profession of orthodontics, I think, more than anything else needs a realization that it must direct its energies toward a re-education, I might almost say a rebirth, that it may know and consider a deeper knowledge of the fundamental sciences that constitute its scientific foundation. It is conceivable that by such adherence to scientific methods it may broaden into a science that may contribute to the well-being of mankind even beyond its own limited field.

Some of our universities are becoming more keenly aware of the handicap under which students of dentistry and its specialties have labored. When the Harvard School of Dental Medicine was established in 1941, it was done with the hope of overcoming this deficiency, so that students now are "well grounded in general architecture and function of the human body," and much better grounded than formerly in the biological sciences. Although the gap between the basic and the practical is narrowing, persistent effort must continue.

When we think of orthodontics in the broader sense we are likely to think of it as dentofacial orthopedics, and with this conception in mind we realize that its practice means a greater amount of sustained effort. It means more resolution, more pertinacity, and a greater expenditure of brain tissue than that required for the tinker type of orthodontics; and if our profession is to hold its head high in pride of its accomplishments, it can do so only at the sacrifice of supermonetary ambitions and a fuller measure of devotion to the search for truth. It is my belief that every orthodontist should in this connection not only seek but also be ever conscious of the essential relationship between the basic sciences and their practical application. I mean by this that he should be educated to a point of full realization of the fundamental knowledge of structure and its complete understanding, so that it becomes easy and natural

for him to make the correct step-by-step advances in treatment in tune with the various phases of physical development in the child. But I regret to say that instead he too frequently proceeds while in a state of mental confusion, his unsure thinking resulting in overanxiety which forces him into a position where he becomes a mere tinker with a mania for numerous gadgets of little value. It is then that the supposed answer to his dilemma is too frequently found in the idea of extracting to make room—the reverse of growth and development. This supposedly easy way out of his dilemma all too often places him in a still deeper position of embarrassment, and his appreciation of values often has little place in his thinking so that his notion of practice becomes further distorted. For example, he becomes distraught when in certain treated cases he fails to establish a permanent alignment of the mandibular incisors, and in an attempt to overcome this minor fault he resorts to the extraction of four perfectly sound and very essential teeth. Thus he inflicts upon the patient a life of oral inadequacy in development and function, forgetting that a moderate inclination of the mandibular incisors is natural and correct for the human race, the extent of inclination varying with the different races of mankind; and, too, he fails to observe that in the lower animals even greater inclinations occur among those that need and use a powerful dental apparatus. Again, who among us would consider for a moment the mutilation of the mouth of our North American Indian? His prognathism is natural. It is part of him. It indicates and expresses the strength of body and mind. It is a sign of his virility as it often is in other races of man. It is easy, then, to understand why some of us condemn orthodontics by caprice rather than by basic considerations. "We all love human faces best when they portray character and not when they are neutral in effect." We do not like to have imposed upon us esthetic rules which banish from our minds an appreciation of natural forms and substitute the artificial and arbitrary patterns of dentofacial forms.

We know that our knowledge of the facts of nature is incomplete; but we number among our keenest minds those who pursue an unending search for the elusive. And all the while nature confirms our belief that there is still truth and beauty enough in our world to give us spiritual and intellectual stimulus, with confidence and hope undiminished.

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60 CHARLESGATE WEST.

AN INSTRUMENT FOR MEASURING MUSCULAR FORCES ACTING ON THE TEETH

LOUIS FELDSTEIN, D.D.S., CHICAGO, ILL.

THE purpose of this paper is to indicate the necessity for measuring the muscle forces acting upon the dental arches and to describe an instrument which has been developed to meet this need. To understand the problem adequately, it seems pertinent to review some historical as well as current thinking regarding the importance of these forces.

Theories regarding the etiology and treatment of malocclusion have been in a state of flux as long as dentists have been interested in the irregular positions of teeth. According to Weinberger,[1] dental authors of the nineteenth century, such as Jobson, Saunders, and Tomes, were of the opinion that a narrow jaw did not allow the teeth to assume a normal position and was thus a causative factor in malocclusion. Therapeutic measures were, therefore, largely reduced to expanding the arch form. At that time, orthodontics was concerned with "straightening of irregular teeth," and only in exceptional cases were the antagonizing teeth taken into consideration. Davenport[2] introduced the concept of functional superiority of normal occlusion, and Angle[3] later established the theory that malpositions of the teeth were problems of occlusion and, accordingly, he devised a system for establishing proper occlusal relationships between the upper and lower dentitions.

However, question as to the retainable results of cases treated in the manner prescribed by Angle became evident in the literature. In 1912 Young[4] described the treatment of a patient in whom the limit of retainable orthodontic expansion had been exceeded. It became apparent that the stability of the denture was dependent on something more than occlusion. This led Wallace[5] to say, "How the arches of the teeth could be expanded and be expected to remain in this expanded position without considering the pressures from the correspondingly augmented tongue is one of the strangest expectations which any class of mechanical men has yet harbored." He felt that the exercise of the tongue during mastication would effect a development of its muscles, the result being a pressure which would expand the dental arches.

This criticism by Wallace was incorporated into the "occlusionist theory." Their reasoning may be summarized as follows: irregularities of the teeth are problems of occlusion. Normal occlusion is functionally the most effective. To attain normal occlusion is, therefore, the aim of orthodontic treatment. If the patient acquires the habit of using the masticating apparatus with sufficient vigor, the surrounding parts will be normally developed and the results of treatment will be permanent. A few of the outstanding exponents of this reasoning

From the Department of Orthodontics, School of Dental and Oral Surgery, Columbia University.

were Brady,[6] Pullen,[7] and Zielinsky,[8] whose influence is apparent in current thinking. Subsequent evaluation of cases treated according to this new hypothesis indicated that increased function and improved occlusion did not necessarily develop surrounding structures and insure a lasting result.

Federspiel,[9] Cryer,[10] and Mershon[11] expressed the opinion that forces of external and internal muscle pressure are active components in producing malocclusion. Clinical proof of the effect on the dentition of these muscular forces was offered by Frey,[12] who demonstrated cases of men whose tongues had been amputated and whose teeth inclined lingually because of lack of support from the tongue.

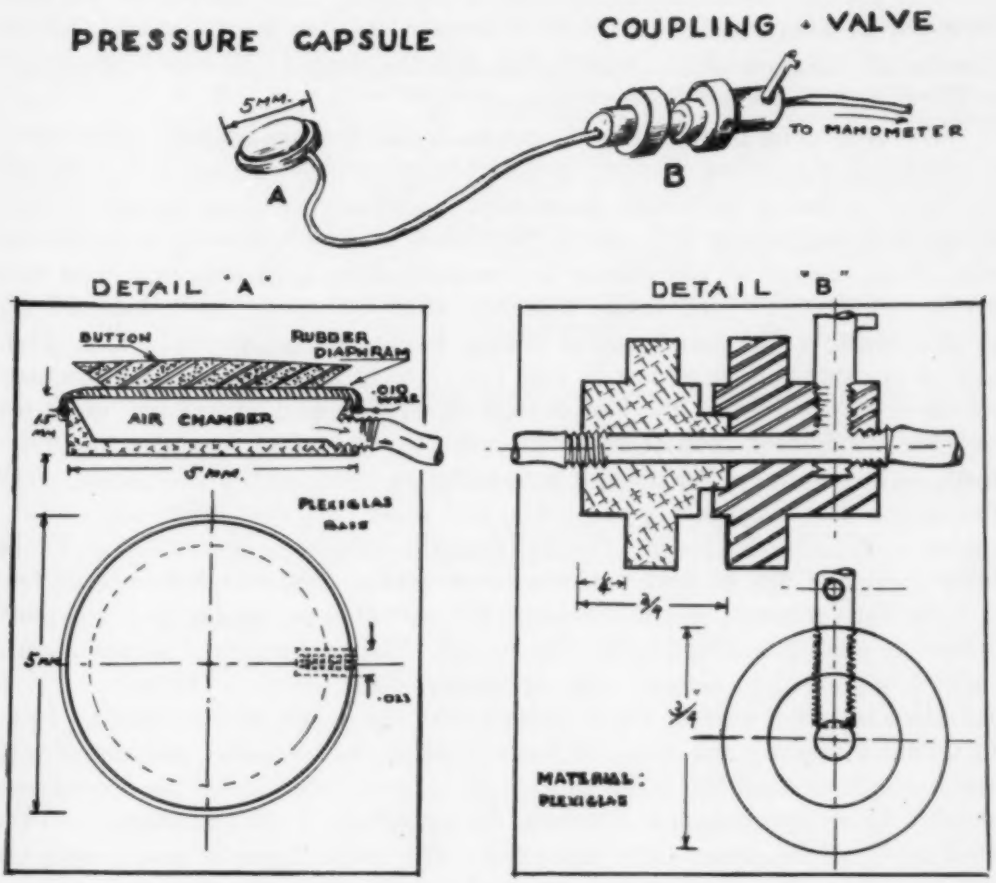

Fig. 1.

The significance of the surrounding muscular forces was emphasized in a series of articles by Rogers,[13, 14, 15] who described a method of muscle training for orthodontic purposes, which Lisher later called "Myofunctional Therapy."

A review of current literature indicates that authors such as Salzmann,[16, 17] McCoy,[18] and Strang[19] concur in the opinion that teeth find a position where there is as much pressure exerted on them by forces which tend to drive them in one direction as by forces which drive them in the opposite direction. The

net result of opposing forces being zero, the teeth are considered to be in a state of equilibrium. Since environmental tissues and structures are regarded as important factors in the etiology of malocclusion, they must be considered in planning orthodontic treatment.

To be able to measure the aforementioned forces is apparently of utmost significance. However, until the present, the determination of the extent of these forces has been largely on the basis of visual speculation. We have had no way of determining whether equilibrium is disturbed as a result of moving teeth into new areas.

The author has devised an instrument for the purpose of measuring the forces of the lips, cheeks, and tongue upon the teeth. This instrument has been approved as adequate for the purpose intended by Dr. Teru Hayashi, Acting Director of the Biophysics Department, and Dr. John L. Nickerson, Professor of Physiology of Columbia University.

The measuring device (Fig. 1) consists of a pressure capsule connected to a manometer containing alcohol. A raised button which is attached to a flexible diaphragm picks up any force exerted on the labial, buccal, or lingual surface of the tooth and causes a change in the volume of air contained within the capsule. This change in air volume is transmitted by a polyethylene tube to a manometer of 0.023 inch inside diameter which effects a displacement of the alcohol within. The sensitivity of such a mechanism is extremely high—it is able to register a force as low as 0.31 Gm., which, according to Dr. Nickerson, compares favorably with the best devices in experimental physiology literature.

The instrument is attached to the buccal or labial surface of a maxillary tooth, or to the lingual surface of a mandibular tooth, with gutta-percha. The flat surface of the capsule is applied so that it contacts the highest point of the convex portion of the tooth. The gutta-percha adheres to the outer rim of the instrument and fills in the remaining space between the rounded tooth surface and the flat surface of the instrument. The incisal or occlusal edge of the tooth is used as a guide in aligning the instrument. The tube attached to the pressure capsule is allowed to extend from the corner of the mouth. The manometer is stabilized on a flat surface which is level with the mouth of the patient. Prior to taking a reading, the levels of the alcohol in the U-shaped manometer tube are brought to equilibrium by raising or lowering one side of the manometer stand. After equilibrium is attained, the couplings of the manometer and the lead tubes of the capsule are connected. The index finger is placed over the valve in the coupling and maximum readings are then recorded, while the patient is allowed to drink 40 c.c. of water slowly.

A preliminary evaluation of the force exerted by the cheeks on the buccal surface of the upper right first molar of 25 patients with Class I or normal occlusion indicates this force to be 3.5 Gm.

Since the instrument was completed recently, it has not yet been possible to obtain a sufficient number of recordings to draw significant conclusions. Therefore, the projected plan, due to the magnitude of the problem and its diversified ramifications, is to continue the research over an extended period. Measure-

ments will be taken of the environmental forces acting upon the teeth prior to initiating treatment, at various stages of treatment, and subsequent to the completion of treatment, with a view to accumulating sufficient data for correlation and evaluation.

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25 EAST WASHINGTON ST.

Editorial

"Now Orthodontic Prescriptions for Laboratory"

NOT too many years ago, eyeglasses were ordered from mail order catalogues. For obvious reasons this custom changed with the times and eyeglasses are now ground and designed to the prescription of the trained oculist.

Not too many years ago many orthodontic appliances were ordered about the same way. The dentist took a mush impression, sent it to the laboratory, and the laboratory in return sent an appliance, presumably designed to treat the case.

Another method formerly popular was for the dentist to take an impression and send it to the dental supply house. He in turn would receive bands, arches, and ligatures for the particular case in hand, a case ensemble, so to speak, all arranged artistically in a plush box, much like jewelry.

The trained orthodontist never followed these methods, however, for the good reason that such methods worked just about like the catalogue eyeglasses and just about as efficiently.

Times are changing as evidenced by the recent bulletin mailed to the dental profession by the University of the State of New York, State Education Department, State Board of Dental Examiners.

The instructions from David W. Beier, D.D.S., Secretary of the Board of Dental Examiners, called attention to formally ammended regulations of the Commissioner of Education by adding a new section. Section 43, dental prescriptions, reads:

> A prescription of a duly licensed and registered dentist for furnishing, constructing, reproducing or repairing prosthetic dentures or bridges to be used and worn as substitutes for natural teeth; or *orthodontic* or other appliances used for the correction of malocclusion or deformities of other structures, as provided in section 6612, 2a, of the Education Law as amended by chapter 564 of the Laws of 1950, shall contain the following elements: (1) the name of the laboratory to which the prescription is addressed; (2) the date on which it is written; (3) a clear description of the work to be done, with appropriate diagrams if necessary; (4) a clear specification of the character of materials to be used; and (5) the signature and license number of the licensed and registered dentist.

Prescriptions, issued by dentists for the purposes described above must conform to the specifications of this regulation.

In addition to the new regulation of Commissioner of Education relating to dental prescriptions, the Department makes the following suggestions:

1. All laboratory work must be accompanied by a prescription as described above. A prescription is required for each piece of work being completed in any type of laboratory including dentist's own office as well as for work sent into this state from other states.
2. The use of prescription blanks 4″ × 6″ is recommended to establish uniformity and facilitate filing.
3. A laboratory which requests work to be done by another laboratory may issue a copy of the original prescription if it is so desired, which would accompany the work required.

In this connection the basic principles set up in the Oklahoma State Dental Act of a few years ago reflect a different viewpoint and create an interesting paradox in the over-all perspective.

In regard to fabricating orthodontic appliances over plaster casts and sending them for treatment of specific cases, this is regarded in Oklahoma as the practice of dentistry and a dental license is therefore required. If a dentist holds himself out as having special qualifications and talent in this field he must have a special orthodontic license to practice according to the Oklahoma law.

The Oklahoma statute obviously provides that he is practicing dentistry who corrects malposed teeth, constructs devices for such cases, outlines, suggests, or directs treatment, whether direct or indirect.

At one time *The Journal of the American Dental Association* (May, 1950) carried an ad soliciting dentists to send plaster casts to a laboratory and have orthodontic appliances made for the purpose of correcting malocclusion. This policy of advertising seems to have been short-lived plainly on account of the numerous protests received against this type of unorthodox orthodontic practice being advocated in dentistry's official journal.

For years much effort has been expended upon such educational organizations as the American Association of Orthodontists, its constituent societies, graduate courses in the leading schools of dentistry, the standardizing efforts of the American Board of Orthodontics, and the thirty-five years of publication of the AMERICAN JOURNAL OF ORTHODONTICS.

If these agencies of education are right or even half right, then the "mail order eyeglasses" approach in treatment has no place in modern orthodontic practice and the record of the specialty seems to verify this.

One thing is certain: orthodontic devices made over the plaster model are as far from the modern concept of orthodontic treatment as the "mail order eyeglasses" are from the scientific correction of the eye, and it is the laboratory groups themselves that should be the first to correct this paradox of orthodontic progress because this kind of promotion is not in step with the scientific problem in hand.

H. C. P.

Reports

THE REPORT OF THE COMMITTEE ON EDUCATION, AMERICAN ASSOCIATION OF ORTHODONTISTS, 1950

IN ORDER to refresh the memories of the members of the Board of Directors of the Association, attention is called to the report of your Education Committee at the meeting held in New York on May 1, 1949. At that time it was pointed out that following the previous year's meeting and that of the American Association of Dental Schools, which took place one month later, the committees of that association and of the American Association of Orthodontists had combined their interests. This action was taken because of the fact that the A. A. D. S. had undertaken a survey of the teaching of orthodontics in the several colleges of dentistry, and your Committee had been appointed with the idea of encouraging this very action.

Your Committee reported last year on the plans that had been laid for the meeting of the schools' association in June of 1949. This consisted of the presentation of an historical résumé of the teaching of orthodontics in colleges of dentistry, which was prepared and presented at the time our report was made to you last year. This was followed, at the schools' meeting, by the reading of the report that had been prepared from data collected by Dr. George R. Moore, Chairman of the Orthodontic Committee of the A. A. D. S. This program occupied one full half day of the dental schools' meeting and was followed by a very brisk discussion.

Immediately following that session the committee was called together by Dr. Blauch and it was decided to request that the committee be allowed to continue its work for another year. Following discussion as to the best means of presenting the orthodontic viewpoint to the general dental teacher, it was decided that a series of lectures be given. These lectures were to be similar to those given to an undergraduate body and would exemplify the type of material, now considered strictly orthodontic, which would be of value to the foundation of the general dentist. Five areas were selected for presentation, and Dr. Gerald Timmons, incoming president of the association, was petitioned for time on the 1950 program to present such a program. Dr. Timmons proved to be very cooperative, as did also the executive committee of the American Association of Dental Schools, and its committee on orthodontics was assigned one entire afternoon and evening of its 1950 meeting. The task of preparing the program was left to your chairman.

The meeting of the American Association of Dental Schools was held at the French Lick Springs Hotel, French Lick, Ind., on March 27, 1950, and the first afternoon and evening of that meeting were devoted to an orthodontic program.

The lecturers were five in number and represented four different institutions, viz:

Dr. Robert Hedges, Chairman of the Department of Orthodontics, Temple University, Philadelphia, Pa.

Dr. Hedges' topic was "Phylogeny of Teeth and Jaws." He pointed out that this material was not only of practical value in the understanding of the dental apparatus but that it formed one of the best bridges between the student's predental biology and his dental training. Carrying his subject into the field of comparative odontology, he stressed those facts and principles that were to be considered common to all animal dentures. Such material, he averred, would add meaning to the course on dental anatomy and physiology.

Dr. Alton W. Moore, Chairman of the Department of Orthodontics, University of Washington, Seattle, Wash.

Dr. Moore's topic was "Mechanism of Adjustment to Wear and Accident." Dr. Moore briefly reviewed the various mechanisms found in animal dentitions which serve the function of maintaining efficiency. Briefly these are, perpetual succession, perpetual growth, perpetual eruption, and specific bone response. Turning to the last, which is that found in man, he talked on the factors of tooth design, bone reaction, and muscle function, illustrating his points with blackboard drawings.

Dr. Turo M. Graber, Northwestern University, Chicago, Ill.

Dr. Graber's presentation was on "Anatomical and Physiological Principles of the Head and Neck." He stressed the point that Nature was purposeful in her designs and that individual bones, by their conformation and their internal architecture, reflected accurately the functions they performed. After considering certain fundamental principles of muscle physiology, he showed by means of well-chosen lantern slide illustrations the arrangement of the various functional groups and the manner in which each had been shown to operate.

Dr. John R. Thompson, Head of the Department of Orthodontics, Northwestern University, Chicago, Ill.

Dr. Thompson spoke on "Application of Anatomical and Physiological Principles to Clinical Fields." He reviewed certain of the points introduced by Dr. Graber and demonstrated the mechanism which maintains the resting position of the mandible. Turning to clinical fields, he applied those principles to clinical dentistry in the fields of restorative procedures, analysis of joint dysfunction, jaw fracture management, and orthodontics.

These four papers completed the program of the afternoon.

The meeting reconvened at 8 P.M. and your chairman presented material on "Growth of the Jaws and Eruption of the Teeth," by means of lantern slides and blackboard sketches. This was a recital of research findings in these two fields and offered the opportunity of imparting certain information as well as indicating the need for the selection of proper methods for the conducting of research procedures.

Following this lecture Dr. Blauch made a few remarks on the reasons for the type of presentations that had been made and then called the participants to the platform for the purpose of permitting the audience to question them on any phase that had been covered on the program as a whole. Dr. George

Moore, the Chairman, closed the program and indicated that, since the program had not permitted the inclusion of recommendations, these would be formulated and presented at the 1951 meeting if the Association so desired.

Subsequent consultation with incoming president Dr. Charles Freeman revealed some opposition to having a single subject occupy a general session for three consecutive years, but a tentative agreement was reached that would permit it at least the submission of a comprehensive report and recommendations to such a session.

At a meeting of the orthodontic committee held the morning after the sessions just reported, Dr. Moore requested Dr. Hemley of New York University to assume the chairmanship and plans were laid for the gathering of material and the arrangement of recommendations to be contained in the report. Another meeting of the committee was arranged to coincide with the meeting of the American Association of Orthodontists to continue this work.

Before closing this report your Committee wishes to restate the principles that have guided its efforts thus far, in order that there shall be no subsequent misunderstanding. It might be added that these principles are unanimously agreed to by the Committee on Orthodontics of the American Association of Dental Schools.

There is no effort being made to expand the course in orthodontics, per se, in the undergraduate curriculum, nor to increase the hours devoted to lectures, techniques, or clinics on the subject. The intention rather is to break down the idea that orthodontics is based upon a special group of theories and to indicate that the biological basis upon which orthodontics stands is one that would be most proper and useful for dentistry. Only after such material was incorporated into the undergraduate curriculum could there be any advantage in a reapportioning of hours. Such inclusion, however, should lead to: (1) a better and more basically trained dental graduate, (2) a better prepared graduate student, and (3) greater mutual understanding and appreciation of the general practitioner and the orthodontist.

Respectfully submitted,

Allan G. Brodie, Chairman,
L. B. Higley,
Thomas D. Speidel.

THE REPORT OF THE RESEARCH COMMITTEE, AMERICAN ASSOCIATION OF ORTHODONTISTS, 1950

IN ACCORDANCE with custom, the Research Committee submits its annual report to the Board of Governors of the American Association of Orthodontists as follows:

For the past several years this committee has directed its attention to two main functions, viz.: (1) the conducting of an annual Prize Essay Competition

and (2) the arranging of a Research Section for the annual meeting of the Association. The present meeting witnesses the sixth consecutive Prize Essay Competition and the third Research Section meeting. The first section was held at the Chicago meeting in 1947 and the second at New York in 1949. No section was held at the Columbus meeting because of lack of time on the program.

This year, as in years past, announcement of the Prize Essay Competition was sent to *The Journal of the American Dental Association,* the AMERICAN JOURNAL OF ORTHODONTICS, and the *Angle Orthodontist,* and notices were printed in each of these periodicals. The response, while not as heavy as in some of the early years, was characterized by more papers of higher quality. Five essays were received and four of these were based on sound research findings.

The papers were submitted in triplicate at the Chairman's office in Chicago and carried no identification. A sealed envelope accompanied each group with only the title of the manuscript on the outside. This envelope, which contained the name and address of the author, was removed and filed before the essays were sent to the other members of the committee for judging. Verdicts were sent back to the chairman who then opened the identification envelopes. The results of the first and only ballot were as follows:

Winner: Dr. Robert E. Moyers, Toronto, Ontario, Canada, for his essay, "An Electromyographic Analysis of Certain Muscles Involved in Temporomandibular Movement."

First Honorable Mention: Dr. Robert M. Ricketts, Chicago, Ill., for his essay, "Variations of the Temporomandibular Articulation as Revealed by Cephalometric Laminagraphy."

Second Honorable Mention: Dr. Louis J. Baume, San Francisco, Calif., for his essay, "The Development of the Dentition of Macaca Mulatta; Its Difference From the Human Pattern."

The two remaining papers submitted for the competition were:

"The Frequency of Deglutition in Man; Its Relationship to Overbite." Dr. Robert M. Kincaid, Columbus, Ohio.

"Gnathostatic Profilograms in Regard to Esthetics." Dr. Joseph A. Sheldon, Asbury Park, N. Y.

Dr. Moyers has been notified that he was the winner of the $500 prize and has been invited to attend this meeting and present his paper. The first three papers become the property of the Association so far as publication rights are concerned.

Dr. Salzmann, the most recent member of the committee, was asked by your chairman to assume the responsibility of arranging the Research Section. As a result of his efforts the section is larger this year than ever before and is more representative. Thirty-four separate items of research completed or in progress appear on the program. Time will probably not permit the presentation of all of them, and a ten-minute limit will have to be placed on those that are given.

No requests have been received this year for any grant-in-aid, but this could well have been because your chairman forgot that $500 had been allotted the committee for this purpose and he failed to make public announcement of it.

In closing this his final report as a member of the Research Committee, your chairman once more entreats you to assign more time for the Research Section. The annual meeting of this Association offers the only opportunity for men who are conducting orthodontic research to meet and discuss their problems. It is unwise to restrict the time allotted to men who are devoting their energies to these efforts. I would not ask for them the privilege of being heard by the entire membership. They would be content if the time now given on the first day to such activities as registration, golf, and trapshooting were set aside and facilities provided for them to meet and discuss together. If a prediction were in order I would prophesy that the Research Section will soon become the chief magnet that draws men to our annual meeting.

I wish to take this opportunity to thank the Board of Governors for its very cooperative and helpful attitude in accepting the recommendations of the Research Committee over the past several years. This has made possible the inauguration of the Prize Essay Competition and of the Research Section, both of which activities now seem well established.

Respectfully submitted,

J. A. Salzmann,
Allan G. Brodie, Chairman,
Wendell L. Wylie.

LIBRARIAN'S REPORT
AMERICAN ASSOCIATION OF ORTHODONTISTS, 1950

WHEN the American Journal of Orthodontics was made available to all members of the American Association, through payment of annual dues, it was decided to discontinue the publication of the proceedings of the annual meetings. This publication seemed a duplication of material already published in the Journal. It will now be necessary for the Association to decide whether to make further additions to the library and, if so, what they should be. It would be possible to add a bound volume of the American Journal of Orthodontics each year, as well as other volumes pertaining to orthodontics or allied subjects.

During the past year the University of Minnesota has taken advantage of the extra volumes of the proceedings available at the American Dental Association Library. There are many of these volumes still available.

The volumes needed to make our bound set of proceedings complete are those of 1906, 1917, and 1918.

Respectfully Submitted,

Richard A. Smith, Librarian.

Department of Orthodontic Abstracts and Reviews

Edited by
DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City

Principles of Orthodontics: By J. A. Salzmann, D.D.S., F.A.P.H.A., Associate Attending Dentist and Head of Orthodontics at the Mt. Sinai Hospital, New York; formerly Head of the Dental Service at the New York City Vocational Schools; Associate Editor of the AMERICAN JOURNAL OF ORTHODONTICS; Editor of the New York Journal of Dentistry. Second edition, Philadelphia, J. B. Lippincott Company, 1950. 533 illustrations.

The basic plan of this text to present principles rather than systems and formulae has been preserved. Growth and development have been brought up to date in the light of recent contributions. The functional anatomy of the face and jaws is explained in a unified and concise manner. Swallowing and chewing and their relationship to dentofacial development and occlusion are more definitely presented.

Differential diagnosis and treatment planning in orthodontics have been expanded. The practitioner of orthodontics will be able to relate his knowledge of growth and development and the employment of diagnostic aids to the demands of actual practice.

The question of extraction, long a controversial subject in orthodontics, is presented in an objective manner, and criteria of an ontogenetic nature are given as a guide in determining the need for extraction in the individual patient.

In this book there is obviously a serious attempt to cover the field of orthodontics in an abridged text, and, at the same time, there is plainly an effort to refrain from keying the book to any particular mechanical device or "system."

It is explained in the acknowledgment that the principles on which orthodontics is based are made up of contributions of many workers in various fields.

The author goes deep into the background of orthodontic practice and opens the first paragraph with the observation, credited to Hooten, that "malocclusions one of the manifestations, of the decline in the human dentition." He then presents chapters on the subjects of orthodontics, prophylactic orthodontics, history of the subject, complete discussion of growth of the head, developments, anatomy, and physiology of the face. Development of the dentition, of tooth eruption and formation, occlusion, endocrines, nutrition etiology, and many other subjects that it is thought are important to the over-all orthodontic perspective are discussed at length.

The reader quickly senses that the author is among those who believe that the serious student of orthodontics must study the background of the entire subject more assiduously, and that he must regard the appliance department as one of the means or a part of correction of malocclusion of the teeth, but not the entire answer.

Hundreds of new references have been added to the new edition. The book is currently used as a text and reference book in dental schools throughout the world, in postgraduate courses in orthodontics, in courses on growth and development for medical students, and by physical anthropologists.

The volume merits careful and serious study by the student and practitioner of orthodontics, as well as by dentists who do not include orthodontics in their practice, because much of the material may be said to constitute the basis of dentistry, especially for children. Reading of this text will add much to the perspective of growth and development of the dental architecture of man.

The book devotes a chapter to the Johnson method, another to the Tweed ideas, and still another to the so-called Norwegian system of removable appliance that has attained considerable popularity abroad.

This book reflects pains and mature thought in preparation, as well as broad comprehensive viewpoints of the author.

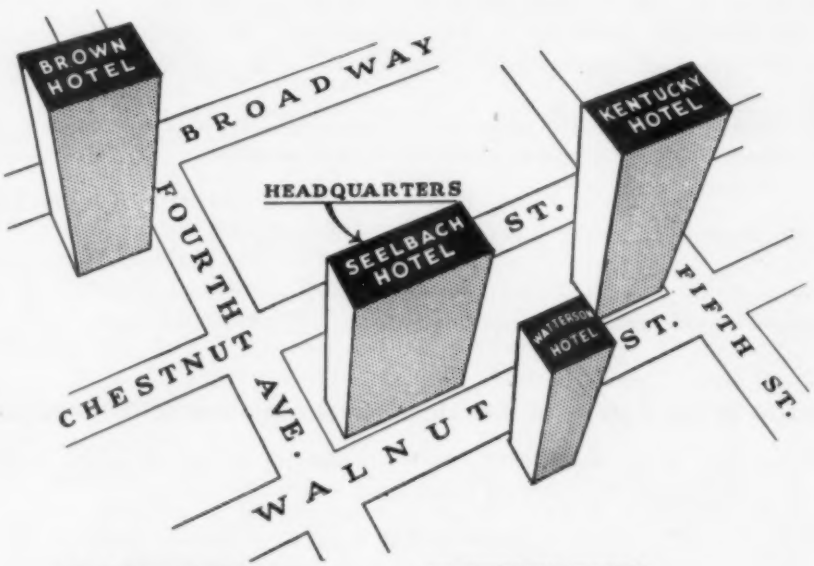
H. C. P.

News and Notes

American Board of Orthodontics

The 1951 meeting of the American Board of Orthodontics will be held at the Seelbach Hotel in Louisville, Ky., April 18 through April 22, 1951. Orthodontists who desire to be certified by the Board may obtain application blanks from the Secretary, Dr. C. Edward Martinek, 661 Fisher Bldg., Detroit 2, Mich. Applications must be received not later than March 1, 1951, for consideration at the Louisville meeting.

Meeting of the American Association of Orthodontists, Louisville, Ky., April 23-26, 1951



SEELBACH HOTEL
Single: $4.00, $5.00, $6.00, $6.50, $7.00
air-conditioned rooms start at $5.00
Double: $7.00 to $11.00
Twin: $7.00, $8.00, $9.00, $10.00, $11.00
air-conditioned rooms start at $8.00
Suite: $18.00 (six only)

WATTERSON HOTEL
Single: $3.25, $3.50, $4.00, $4.50
Double: $5.50, $6.00, $6.50, $7.00
Twin: $6.50, $7.00, $8.00
Suite: $8.00, $10.00, $12.00
air-conditioned rooms $1.00 extra

KENTUCKY HOTEL
Single: $3.50 to $6.00
Double: $5.50 to $10.00
Twin: $7.00 up
Suite: $14.00 to $18.00
Room for three people: $9.00
air-conditioned rooms $1.00 per day extra

BROWN HOTEL
To secure rates and reservations at the Brown Hotel communicate direct with hotel.

The above picture shows the location of the hotels. Louisville is centrally located—so are the hotels. Reservation cards will be sent to the members. Reservations should not be sent directly to the hotels, but to Dr. John A. Atkinson, 896 Starks Bldg., Louisville 2, Ky.

Prize Essay Contest, American Association of Orthodontists

Eligibility.—Any member of the American Association of Orthodontists; any person affiliated with a recognized institution in the field of dentistry as a teacher, researcher, undergraduate or graduate student shall be eligible to enter the competition.

Character of Essay.—Each essay submitted must represent an original investigation and contain some new significant material of value to the art or science of orthodontics.

Prize.—A cash prize of $500 is offered for the essay judged to be the winner. The committee, however, reserves the right to omit the award if in its judgment none of the entries is considered to be worthy. Honorable mention will be awarded to those authors taking second and third places. The first three papers will become the property of the American Association of Orthodontists and will be published. All other essays will be returned.

Specifications.—All essays must be typewritten on 8½ by 11 inch white paper, double-spaced with 1 inch margins, and composed in good English. Three copies of each paper, complete with illustrations, bibliography, tables, and charts must be submitted. The name and address of the author must not appear in the essay. For purposes of identification, the author's name, together with a brief biographical sketch which sets forth his or her dental and/or orthodontic training, present activity and status (practitioner, teacher, student, research worker, etc.), should be typed on a separate sheet of paper and enclosed in a sealed envelope. The envelope should carry the title of the essay.

Presentation.—The author of the winning essay will be invited to present it at the meeting of the American Association of Orthodontists to be held at Louisville, Ky., April 23-26, 1951.

Final Submission Date.—No essay will be considered for this competition unless received in triplicate by the Chairman of the Research Committee on or before March 1, 1951.

WENDELL L. WYLIE, Chairman, Research Committee,
American Association of Orthodontists,
University of California Medical Center,
San Francisco 22, Calif.

Changes in the Bylaws of the American Association of Orthodontists

We would like to add the following to the changes in the bylaws of the American Association of Orthodontists published in the August issue of the JOURNAL:

CHAPTER I

MEMBERSHIP—ACTIVE MEMBERS

SECTION 1. The presentation to the Secretary of this Association of a certified roster of active members in good standing by the Secretary of a constituent society, together with the annual dues, constitutes active membership in the Association of those so certified.

SECTION 2. Eligibility of Active Members.

(B) A person elected to active membership shall retain his membership in his local, state, and national dental organizations, unless otherwise provided for by the Board of Directors.

SECTION 3. Sixty days after January 1st the Secretary shall drop from the membership roll the names of those whose dues for the current year have not been received. Any member dropped from the roll in this manner may be reinstated by complying with the provision of a constituent society relating to the reinstatement of members.

SECTION 8. Active members, upon being admitted to membership in a constituent society, shall be required to sign a pledge to adhere to the Code of Ethics of the American Association of Orthodontists, as provided by Chapter 12, Section 1 and 2, of these By-Laws.

SECTION 9. The American Association of Orthodontists shall receive for each applicant elected a fee of twenty dollars ($20.00), which shall be collected by the Constituent Society and remitted to this Association. This fee shall pay the dues for the current fiscal year or any part remaining thereof and shall entitle the newly elected member to receive without cost the official publication of this Association for a like period.

CHAPTER XIV

SECTION 6. The standards of eligibility for active members in the Constituent Society shall be as high as those in the Association.

SECTION 7. The Constituent Societies may have various classes of membership, but only active members shall have the privilege to vote and hold office.

Advance Program for the Meeting of the Central Section of the American Association of Orthodontists, Nov. 27 and 28, 1950, at the Roosevelt Hotel, Cedar Rapids, Iowa

MONDAY, NOVEMBER, 27

9:15 A.M. Meeting called to order
President's remarks

9:45 A.M. Essay:
The Mechanical Therapy Employed in Following the Tweed Philosophy in Orthodontics. B. L. Herzberg, Chicago, Ill.

10:45 A.M. Essay and Motion Pictures:
Labial and Lingual Arch Technique. Oren A. Oliver, Nashville, Tenn.

11:30 A.M. Business Meeting

LUNCH

2:00 P.M. Essay:
Some Thoughts About Anchorage. Howard E. Strange, Chicago, Ill.

3:00 P.M. Case Report:
Cephalometric Appraisal of a Class II, Division 1 Case of Malocclusion Treated With the Twin Arch Mechanism. William F. Ford, Chicago, Ill.

3:30 P.M. Essay:
Cross-bites and Their Management. Chester F. Wright, South Bend, Ind.

8:00 P.M. Table Clinics

TUESDAY, NOVEMBER 28

9:30 A.M. Essay:
Procedure in Treatment of Class II, Division 1 Mandibular Displacement Cases. Joseph R. Jarabak, Homewood, Ill.

10:30 A.M. Essay and Motion Pictures:
Technique of the Guide Plane. Oren A. Oliver, Nashville, Tenn.

11:15 A.M. Case Report:
Treatment of a Class II Case With the Occlusal Guide Plane and the Twin-Wire Appliance. Kenneth E. Holland, Lincoln, Neb.

LUNCH

2:00 P.M. Case Report:
Treatment of a Class I Bimaxillary Protrusion, Utilizing the Philosophy and Technique of Dr. Charles H. Tweed. George L. Englert, Danville, Ill.

2:30 P.M. Essay:
Correction of Abnormalities of Occlusion by Grinding. Charles H. M. Williams, Toronto, Canada

4:00 P.M. Final Business Meeting.

For the wives who attend, the hostesses have arranged a dinner and social evening on Monday to coincide with the banquet, social hour, and clinics for the members. There will be Bridge and Canasta for the ladies who wish to play. On Tuesday morning, if weather permits, the ladies will take a trip of about twenty miles to the Amana Colonies, including luncheon in one of the quaint dining rooms. Beautiful woolens and hand-turned furniture produced by these industrious people can be seen or purchased. Free transportation will be provided those who wish to go.

Southwestern Society of Orthodontists

The following is the program of the Southwestern Society of Orthodontists, held at Monroe, La., under the leadership of President Nathan Gaston, Oct. 15, 16, 17, and 18, 1950.

SCIENTIFIC PROGRAM

President's Address. Nathan G. Gaston, D.D.S.

Biology of Bone, With Special Reference to Orthodontic Tooth Movement. Part I. Harry Sicher, M.D., Chicago, Ill.

Luncheon. Your American Association. Joseph E. Johnson, D.D.S., President of the American Association of Orthodontists.

Case Report. Donald A. Closson, D.D.S., Kansas City, Mo.

Case Report. Bibb Ballard, D.D.S., Dallas, Texas.

A Series of Cases With Models and Photographs Taken Over a Period of Years Showing the Growth and Development After Normal Occlusion Has Been Established. Joseph E. Johnson, D.D.S., Louisville, Ky. Class Captain: Fred A. Boyd, D.D.S., Abilene, Texas.

Orthodontics, A Prescribed Therapeutic Procedure. Spencer R. Atkinson, D.D.S., Pasadena, Calif. Class Captain: J. Victor Benton, Wichita, Kansas.

GENERAL CLINICS

Clarence W. Koch, D.D.S., Chairman

Tuesday, October 17

1. An Auxiliary Labial Appliance. Drs. Alstadt and Smith, Little Rock, Ark.
   "This appliance has been found practical for orthodontists who basically use labio-lingual technique."
2. Treated Cases:—Three and Four Years Out of Retention. Dr. Bibb Ballard, Dallas, Texas.
3. A Case of Ectopic Eruption of the Upper Cuspids. Dr. Donald A. Closson, Kansas City, Mo.
   "Upper cuspids erupting mesial to normal position. Correct diagnosis is most important in this type of case; otherwise, permanent damage may possibly occur to the upper laterals."
4. Models of a Few Cases Treated With the Edgewise Appliances. Dr. S. P. Crain, Midland, Texas.
5. A Simplified Method of Constructing Light Labial Arches. Dr. Joe Favors and Dr. Frank Roark, Dallas, Texas.
   "A quick, easy method of constructing a light labial arch for use with the twin-snap channel bracket. Also, a few of the ways in which the labial is employed."
6. Completed Adult Orthodontic Cases. Dr. Robert E. Gaylord, Dallas, Texas.
7. Leica Photography in Orthodontics. Drs. Pugh and Benton, Wichita, Kan.
   "Progressive slides on cases treated with Johnson Twin Arch. Kodoscope will be used."
8. A Few Finished Cases. Dr. Roy G. Roberts, Wichita Falls, Texas.
9. Unusual Method Replacing Lost Incisors in Children. Dr. Harry H. Sorrels, Oklahoma City, Okla.
   "Since there is always a problem in replacing lost incisors in children, I offer you one means of solving this situation."

Wednesday, October 18

Appliance Clinic. Spencer R. Atkinson, D.D.S., Pasadena, Calif.

Twelfth Australian Dental Congress

On the occasion of the Twelfth Australian Dental Congress held in Sydney August 21 to 26, the opportunity was taken to re-form the Australian Society of Orthodontists as a specialist orthodontic group.

This group was inaugurated in Melbourne in 1927 during the Sixth Australian Dental Congress, but its function was interrupted during the course of World War II.

The officers elected on that occasion are as follows:

President: A. Thornton Taylor, Sydney
Secretary-Treasurer: Robert Y. Norton, Sydney
Council: Kenneth T. Adamson, Melbourne
Victor P. Webb, Brisbane
Robert W. Halliday, Sydney

American Academy for the Advancement of Science

The meeting of the American Academy for the Advancement of Science will be held in Cleveland, Ohio, Dec. 26 to 30, 1950.

N2—SUBSECTION ND.—DENTISTRY

Chairman, the Chairman of the Section and of Local Arrangements, Thomas J. Hill, Western Reserve University, Institute of Pathology, Cleveland, Ohio.

Secretary, Russell W. Bunting, University of Michigan, School of Dentistry, Ann Arbor, Mich.

PROGRAM OF SUBSECTION ND.

Friday Evening, December 29

Municipal Auditorium
Thomas J. Hill, presiding

1. Dean, H. Trendlay, National Institute of Health, Bethesda, Md. Dental Research at the National Institutes of Health.
2. To be announced. The Role of Dentistry in Atomic Warfare Civil Defense.

Saturday Morning, December 30

Municipal Auditorium
Isaac Schour, presiding

1. Schlack, Carl A., Office of Naval Research, Washington, D. C. Past and Present Dental Researches in the Navy.
2. Dickson, George, National Bureau of Standards, Washington, D. C. Self-Curing Resins for Dental Restorations.
3. Bartlestone, Herbert J., Veterans Administration, Washington, D. C. I/131 Studies of Enamel and Dentine Permeability in vivo.

Saturday Afternoon, December 30

Municipal Auditorium
Paul C. Kitchin, presiding

1. Bernier, Joseph L., Armed Forces Institute of Pathology, Washington, D. C. Further Studies on the Incidence of Epithelial Malignancies of the Oral Regions.
2. Burnett, George W., Army Medical Research Center, Dental Branch, Washington, D. C. An Investigation of the Role of Filamentous Organisms in Dental Caries.
3. Palmer, Hubert B., Department of Air Force, Washington, D. C. A Study of the Resistance of Human Molar Teeth to Decalcification Caused by Growth Products of *Lactobacillus Acidophilus*.

American Dental Association

Steps should be taken now to prevent a repetition of the flagrant wastage of dental and medical manpower that occurred in World War II, *The Journal of the American Dental Association* declared editorially today.

The recently enacted physician-dentist draft law has received the full support of the Association but it "is only a good beginning," the Journal said.

"As yet," the editorial added, "no adequate provision has been made to prevent the various branches of the armed forces from competing for dental and medical officers, a condition which, during World War II, resulted in the Dental Corps of both the Army and Navy being overstaffed and many civilian communities being stripped of essential health services."

The ediorial called for procedures to solve the problem of apportioning equitably the services of dentists and physicians between military and civilian needs.

"Effective machinery should be perfected immediately," it continued, "to prevent dentists and physicians badly needed by the civilian population from wasting their time and talents in non-professional service as many were forced to do in World War II."

Federal Security Agency, Children's Bureau

HEALTH SERVICES FOR SCHOOL-AGE CHILDREN

Increasing popular concern about better health services for school-age children is challenging educational and health workers to make fuller use of their health resources. But the big question in many communities, those with limited resources, is just how. Since all communities cannot meet all the health needs of their school-age children, they are faced with the necessity to choose which services they should attempt to provide and which they should not attempt, at least while their resources are limited.

To help professional people in making such decisions there is now available a new booklet, "Priorities in Health Services for Children of School Age." Issued jointly by the Children's Bureau, Office of Education, and Public Health Service, all of the Federal Security Agency, this short booklet consists of recommendations of an Agency-wide committee on school health, and incorporates many of the findings of a conference held last year attended by a number of specialists in the field.

After outlining the various categories of resources that a community, ranging from the community with only a part-time nurse to one with many services, might have, the booklet discusses in greater detail the factors to consider in developing an over-all program, and the priorities to be given each under different conditions. Then attention is given to the priorities connected with the detection, diagnosis, and follow-up to assure care of specific conditions or diseases, such as scabies, epilepsy, rheumatic heart disease, harelip, and malnutrition. Since few communities can develop organized programs of service for all conditions or diseases affecting children, suggested criteria are listed in order to help in determining the priority to be given each in a program.

The booklet stresses that much research is needed in order to find the best answers to many problems—they are not attempted here. Nevertheless the booklet is presented as another aid for public health workers and school officials in planning their programs. Single copies of "Priorities in Health Services for Children of School Age" are available to professional people without charge from the Children's Bureau, Federal Security Agency, Washington 25, D. C.

DEMONSTRATION PROGRAM FOR EPILEPTIC CHILDREN

A State-wide demonstration program to help epileptic children recently got under way in Maryland. Financed largely with funds from the Children's Bureau, Federal Security Agency, the program includes operating two central diagnostic clinics in Baltimore, at Johns Hopkins Medical School and at University of Maryland Medical School, supplying the drugs needed in controlling the various types of epilepsy in children. All 23 county health departments in the State plan to take an active part in the program: through case finding and referral of patients to the central clinics for diagnosis, and through follow-up work. After diagnosis of a child the central clinic advises the local health department of the treatment needed, which is carried out jointly with the family physician. Specialists from both medical schools cooperate in the operation of the clinics which are equipped with electroencephalographs.

An important part of the program includes the holding of extension clinics in various parts of Maryland to provide for the location, diagnosis, and treatment of children with epilepsy and to keep local physicians and public health workers informed on developments in the diagnosis and treatment of epilepsy in children.

Every practicing physician in the county referred epileptic children to the first such clinic held under the auspices of the local health department.

GUARDIANSHIP FOR CHILDREN

More than 10 per cent of the Nation's children live away from home, nearly a third of whom are living in homes of nonrelatives or in institutions. For their proper care and

protection, many of these children are in need of attention to their personal guardianship. Yet, because State guardianship laws are probably the most archaic of those relating to children, a great many children are denied the full social and legal protection to which they are entitled. War casualties of many parents, as well as postwar upheavals of many families, are developments of recent years that make sound guardianship and procedure, as they affect children, a more pressing problem than ever before.

The lack of up-to-date information on guardianship procedures and practices prompted the Children's Bureau, Federal Security Agency, to study the problem. The findings of this study are discussed at some length in a new publication, *Guardianship for Children, a Way of Fulfilling Public Responsibility*, published by the Bureau.

Some of the aspects of guardianship treated in the bulletin deal with: the underlying philosophy including the historical development in the law, the legal framework, the relationship between guardian and ward, the role and procedure of the court, the use of social services, and the effect on Federal benefits and other financial aid programs.

Eight major recommendations are presented on sound legislation and its greater use for the better guardianship of the person and the estate of children.

Copies of *Guardianship for Children* (Children's Bureau Publication 330) may be purchased at 45 cents each from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

GUIDE ON CARE OF HARD-OF-HEARING

More than two million children in the United States have hearing losses needing medical attention, yet only a small proportion get the well-rounded care new scientific developments have to offer, such as: audiometer testing, prevention through the use of the sulfonamides and antibiotics, medical and surgical treatment, adjustment to the hearing loss through the use of hearing aids, and auditory and speech training.

So says a new booklet for professional workers, *Services for the Child Who Is Hard of Hearing*, recently published by the Children's Bureau, Federal Security Agency.

Many children, the booklet points out, are erroneously judged to be totally deaf—a rare condition in children—and too frequently placed in special institutions, when actually many can be helped by these new developments and thus lead reasonably normal lives at home.

Fortunately, a growing number of public and private health workers and others are using, or are interested in using, these modern techniques in testing and treating children with hearing handicaps. To help meet the increasing need for information on them the Bureau prepared this booklet which touches on some of the recent thinking and experience of specialists in the field.

The booklet is divided into two parts: the first deals with the over-all problem of testing and treating various types of hearing loss; the second outlines the essentials of a good hearing program under health department auspices.

Single copies of *Services for the Child Who Is Hard of Hearing* are available on request from the Children's Bureau, Federal Security Agency, Washington 25, D. C.

Notes of Interest

The practice of Robert L. de Shong, D.D.S., is limited to orthodontics at 202 Kresge Bldg., Oil City, Pa., and at Crawford Co. Trust Bldg., Meadville, Pa.

Dr. Bercu Fischer announces that his son, Dr. Harold Fischer, is now associated with him in the exclusive practice of orthodontics at 2 East 54th St., New York, N. Y.

Dr. Henry D. Furgatch of 31 East 12th St., New York City, announces the opening of an additional location at 214-04 46th Road, Bayside, L. I., practice limited to orthodontics.

Dr. Ralph Olds Leonard announces the opening of his office at 420 Marion National Bank Bldg., Marion, Ind., practice limited to orthodontics.

Dr. Paul J. McKenna announces the opening of his offices at 14 Chestnut St., Springfield, Mass., practice limited to orthodontics.

OFFICERS OF ORTHODONTIC SOCIETIES

The AMERICAN JOURNAL OF ORTHODONTICS is the official publication of the American Association of Orthodontists and the following component societies. The editorial board of the AMERICAN JOURNAL OF ORTHODONTICS is composed of a representative of each one of the component societies of the American Association of Orthodontists.

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President-Elect, Bernard G. deVries _____ Medical Arts Bldg., Minneapolis, Minn.
Vice-President, Homer B. Robison _____ Rorabaugh-Wiley Bldg., Hutchinson, Kan.
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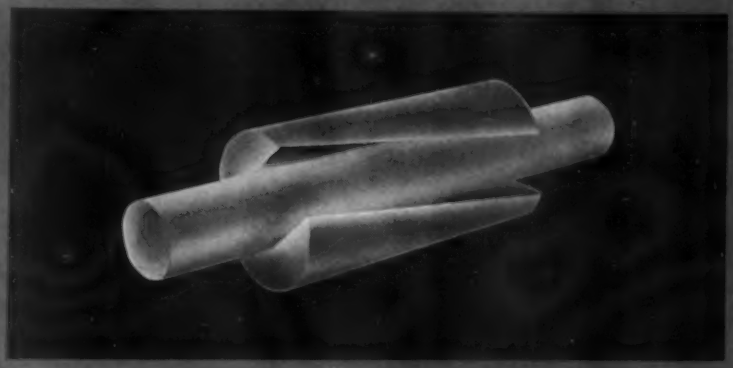


ADERER *Swirlok*

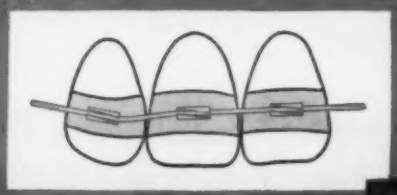
TRADE MARK

SELF-LOCKING BRACKET

slip wire through slot ... and bracket is "tied"!

The Aderer Swirlok is by far the easiest-to-use and the most efficient bracket made. Just slip .016" arch wire through the swirl-cut . . . and the bracket is "tied"!

They are made in a platinum-color, high-fusing, hard precious metal—either unmounted or mounted on regular Aderer band strips or Dr. Downs' design contoured band strips. Swirlok Brackets are supplied in two lengths of .016" (inside diameter)—both priced the same as our regular mounted and unmounted Edgewise Brackets.



Swirlok Brackets produce rotation without use of rotating ligatures! They afford maximum comfort for the patient because of reduced bulk and absence of sharp edges.

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*As suggested by Dr. A. Sved

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ıncy at this point.

or the pagination is incorrect.

e book is found in the collections.

A job to be done.

Illness, accidents, and other unforeseen events each year bring hardship to an increasing number of fellow dentists—compelling them to call upon the A.D.A. Relief Fund for aid.

In order to bring even the barest essentials into the homes of needy dentists in 1951, the fund requires the support of every member of the profession. THE GOAL THIS YEAR IS $100,000. The need is great . . . your immediate contribution is vital.

WHERE YOUR MONEY GOES

One-half of your contribution to the A.D.A. Relief Fund is automatically allotted to your state society. In addition, the A.D.A. Relief Fund pays two-thirds of each grant. Your state and district societies pay the other one-third.

This Year Give More Through the A.D.A. Christmas Seal Campaign

SEND YOUR CONTRIBUTION TODAY TO THE AMERICAN DENTAL ASSOCIATION RELIEF FUND, 222 E. SUPERIOR STREET, CHICAGO 11, ILLINOIS

AMERICAN JOURNAL OF ORTHODONTICS

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